Covenant of Mayors
Committed to urban sustainable energy

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On behalf of BMZ Federal Ministry for Economic Cooperation and Development

SUSTAINABLE ENERGY ACTION PLAN OF THE CAPITAL CITY OF PODGORICA

Podgorica, May 2011

Podgorica (MNE) Zagreb (CRO) Tirana (ALB) Sarajevo (BIH) Skopje (MAC) Freiburg (GER)

Network of energy efficient capital cities in SEE/Mreža energetski efikasnih glavnih gradova u JIE

Contents:

1. Introduction

1.1. Covenant of Mayors initiative

The European Commission launched on 29th January 2008 a major initiative of linking the energy-conscious mayors of European cities in a permanent network with the aim of exchanging experiences in implementing effective measures to improve energy efficiency in urban areas. The Covenant of Mayors is the response of advanced European cities to the challenges of the global climate change, and the first and most ambitious initiative of the European Commission, which directly targets local governments and citizens through their active and continuous involvement in the fight against global warming. By signing this agreement the Mayors commit, according to the proposal of the European Energy Policy from 2007, that they will implement a number of energy efficiency measures to reduce CO_2 emission in their cities by more than 20% by 2020.

The roles of local authorities and other local government bodies in implementation of the specified obligations defined in the Covenant of Mayors refer to:

- Implementation of energy efficiency measures, projects and programmes in public buildings owned and used by cities;
- Implementation of measures, projects and programmes aimed at increasing quality and energy and environmental efficiency in the public city transport sector;
- Implementation of energy efficiency measures, projects and programmes in the public lighting sector in the territory of the city;
- Planning urban development based on the principles of energy and environmental sustainability;
- Continuous informative and educational activities and campaigns on the methods to increase energy efficiency and CO_2 emission reduction in order to raise awareness among citizens on the need to save energy in all segments of life and work;
- Support for programmes and initiatives of various physical and legal entities aimed at using more renewable energy sources;
- Promotion of local energy production from renewable sources and cogeneration.

The Covenant also defines specific responsibilities of the signatories:

- Elaboration of CO_2 Baseline Emission Inventory (hereinafter referred to as the Inventory) as the basis for elaboration of the Sustainable Energy Action Plan – SEAP (hereinafter referred to as the Action Plan);
- Elaboration and implementation of the Action Plan;
- Control and monitoring of the Action Plan implementation;
- Submission of reports on the Action Plan realization to the European Commission every two years;
- Adjustment of the city administration structure in order to provide the required expert potential for the Action Plan implementation;

- Regular informing of the local media on the results of the Action Plan implementation;
- Informing citizens on the possibilities and benefits of efficient use of energy;
- Organizing Energy Days or City Covenant Days, in cooperation with the European Commission and stakeholders;
- Attending and contributing to annual Conferences of the mayors of EU cities on the energy sustainable Europe;
- Sharing know-how with other cities and municipalities.

2012 cities signed the Covenant until 3rd November 2010, and the interest for accession of new cities is very high. It is interesting to mention that the initiative has reached beyond the borders of Europe and expanded globally. Along with over 2000 European cities, the Covenant has also been signed by the mayors of the capital of Argentina, Buenos Aires, and Christchurch in New Zealand. Among the European countries, the largest share in this initiative belongs to Spanish (754) and Italian (726) cities. Among the Montenegrin cities, the first one to join the initiative was the Capital City of Podgorica, on 3rd December 2009, followed by Niksic and Kolasin, pursuant to the responsibilities assumed upon signing of the Memorandum of Understanding.

Figure 1.1 The Covenant of Mayors signing ceremony on 4th May 2010 in the European Parliament Hemicycle in Brussels, attended by the Mayor of Podgorica, Mr. Miomir Mugoša, PhD

1.2. What is a Sustainable Energy Action Plan?

The mayors signing up to the Covenant of Mayors commit to submit their Sustainable Energy Action Plans (SEAPs) to the European Commission within a year. Sustainable Energy Action Plan is a key document identifying and showing, based on

the collected data on the present situation, precise and clear guidelines for the implementation of energy efficiency projects and measures and the use of renewable energy sources at the city level, which will result in CO_2 emission reduction by more than 20% by 2020.

Main goals of the Action Plan elaboration and implementation are as follows:

- To reduce CO_2 emission in all sectors through implementation of energy efficiency measures, using renewable energy sources, energy consumption management, education and other measures;
- To contribute, as much as possible, to security and diversification of the city power supply;
- To reduce energy consumption in buildings, transport and public lighting sectors;
- To increase the share of energy generated from renewable sources;
- To promote sustainable development in urban areas.

The Action Plan focuses on long-term transformation of energy systems in cities and provides measurable goals relating to reduction of energy consumption and CO_2 emission.

Obligations from the Action Plan refer to the entire area of the city, both the public and the private sectors. The Plan defines the measures and activities in buildings, transport and public lighting sector excluding industry sector. The Action Plan should be harmonized, in all its segments, with the institutional and legal framework at the EU, national and local level and cover the period until 2020.

The European Commission has prepared a Guidebook for elaboration of the Sustainable Energy Action Plan in order to facilitate its preparation and implementation by city administrations, as well as comparison of the results achieved among the European cities.

In the implementation phase of the Action Plan, cities will submit periodical reports on implementation and progress in realization of the goals set to the European Commission, and they will be provided with a special reporting form for that purpose.

1.3. Energy policy of the Capital City of Podgorica

Administration of the Capital City of Podgorica was the first one in Montenegro to commit to energy sustainable development of the city based on the principles of energy efficiency, sustainable construction and use of renewable energy sources. The following documents have been adopted for that purpose:

The Covenant of Mayors was signed by the Capital City on 4th May 2010 in Brussels, placing Podgorica among the cities whose common goal is to achieve CO_2 emission reduction by over 20% by 2020, to increase the share of energy generation from renewable sources by 20% and to reduce energy consumption in the same level through planned activities.

At the conference called “Sustainable Development of Cities” held in Zagreb in April 2009, the **“Letter of Intent”** was signed for the cooperation on the “Building Capacities for Energy Management” project in the cities of Podgorica, Zagreb, Sarajevo and Skopje together with the city of Freiburg which has achieved the most significant results in the field of energy efficiency and use of renewable energy sources. Approval of the Project and the budget were provided by the German Federal Ministry of Economy, to be realized through GTZ by June 2011.

The following step in realization of the Project was the signing of the **“Memorandum of Understanding”** in October 2009 in Freiburg in the presence of the Mayor of this city, which expressed clear commitment of all partner cities to building capacities, both human and organizational, for energy management within the joint project called the Capital Cities Initiative. During this study visit, the representatives of the partner city of Freiburg introduced us to the functioning of the city management in the field of sustainable development of this city, in particular regarding the measures, activities and results they achieved by applying the so called “green energy”.

By signing and adopting the **“Energy Management and Environment Protection Policy Statement”** in November 2009, the Capital City of Podgorica continued realization of the activities within the defined Project. After the Statement was signed by the Mayor, Mr. Miomir Mugosa, PhD, the Capital City Assembly unanimously adopted the stated document, together with the Project status information, thereby confirming its further efforts regarding protection and improvement of the environment through sustainable management of energy as a significant resource.

Successful realization of the Project required forming of the **Energy Management Office** with the Info Center, verified by the Capital City by adopting the Decision establishing the Office, in November 2009. Functioning of the Office required appointment of two persons who had adequate qualifications and relevant certificates to perform the specified tasks and duties in full. Deputy Mayor of Podgorica was appointed as the representative of the Capital City in the Project Steering Committee, with a role to coordinate implementation of all activities relating to realization of the Project on behalf of the Capital City.

Pursuant to the clearly expressed commitment, the Capital City of Podgorica adopted the document called **“Recommendations for Designing, Construction and Maintenance of the Public Lighting and Traffic Lights”** in November 2008, defining the electricity consumption saving targets in the field of public lighting and traffic lights. To that regard, reconstruction of the existing lighting is underway as well as construction of new lighting, which already contributes with significant saving in energy consumption, and the long-term effect will reflect in results achieved in the following exploitation period.

2. Methodology

2.1. The process of elaboration, implementation and monitoring of the Sustainable Energy Action Plan of the Capital City of Podgorica

The process of elaboration, implementation and monitoring of the Sustainable Energy Action Plan of the Capital City of Podgorica is a complex task that can generally be divided into 6 main steps:

1. Preparatory work for the elaboration process (political will, coordination, technical resources, stakeholders, etc.);
2. Elaboration of the Sustainable Energy Action Plan of the Capital City;
3. Adoption of the Action Plan as an official document of the Capital City;
4. Implementation of identified measures and actions according to the plan of measures and activities in accordance with the defined schedule and time frame;
5. Monitoring and control of the implementation of the measures identified under the Plan of Measures and Activities;
6. Preparing reports on the projects realized within the Plan of Measures and Activities every 2 years.

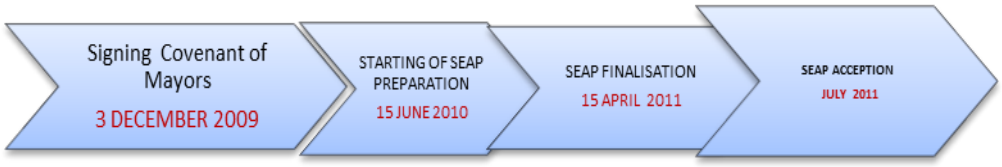

Figure 2.1 Duration and key steps of SEAP Podgorica

Within the 6 main steps there is a number of activities to be implemented for the successful realization of the Process.

2.2. Preparatory activities for the elaboration process

The main activity in the preparation phase of the Process is to achieve the political will for its initiation and implementation by ensuring support from the Mayor and the City Assembly. Through its accession to the Covenant of the Mayors, the Capital City demonstrated a positive attitude of the City Administration for sustainable energy development, which was the first step in the right direction. It is important that the management of the City Administration is a part of the process as early as from the preparation phase, that is to provide their active support in other stages of the process. That is the only way to ensure successful implementation of the process.

The tasks of the city administration in realization of the Action Plan are as follows:

- To integrate successfully the objectives and measures of the Action Plan within the Capital City development strategy;
- To provide financial resources to implement the measures;
- To provide professional staff to implement the identified measures regarding energy efficiency and renewable energy sources;
- To support continuous implementation of measures throughout the period of the Action Plan implementation by 2020;
- To ensure monitoring and reporting on the dynamics of the Action Plan implementation by 2020;
- To inform citizens continuously on the Action Plan implementation;
- To ensure the participation of stakeholders and citizens in the entire process from the elaboration to monitoring of the Action Plan implementation;
- To join the network of cities signatories to the Covenant of the Mayors towards continuous sharing of positive experiences and mutual synergies in building energy sustainable urban areas in Europe.

The benefits of successful completion of the process of elaboration, implementation and monitoring of the Action Plan for the Capital City and its citizens are multifold, but also for the City Administration which will achieve the following goals through successful implementation of the entire process:

- to demonstrate its commitment to sustainable energy development of the Capital City based on the principles of environment protection, energy efficiency and use of renewable energy sources as an imperative for sustainability in 21st century;
- to set up the basis for energy sustainable development of the Capital City;
- to launch new financial mechanisms to initiate and implement the measures relating to energy efficiency and use of renewable energy sources in the Capital City;
- to ensure long-term secure energy supply of the Capital City;
- to improve the quality of life for its citizens (to improve air quality, reduce traffic congestion, etc.).

Successful elaboration and implementation of the Action Plan would benefit directly or indirectly to all citizens of the Capital City of Podgorica who will participate in all phases of realization through the representatives of various interest groups. Involvement of as many stakeholders as possible is the starting point in the process of changing attitudes on energy management and behavior of the citizens.

Stakeholders in elaboration and implementation of the Action Plan should include all those:

- whose interests relate to the Action Plan in any way;
- whose activities affect the Action Plan in any way;
- whose ownership, access to information, sources, expertise etc. are required for successful elaboration and implementation of the Action Plan.

The first step is to identify the stakeholders, and the next one is to determine their specific roles and tasks in the process of elaboration, implementation and monitoring of the Action Plan.

2.3. Sustainable Energy Action Plan of the Capital City of Podgorica

The Sustainable Energy Action Plan of the Capital City of Podgorica includes 10 main activities:

1. Determining of the baseline year;
2. Analysis of energy consumption by sectors, for buildings, transport and public lighting sectors;
3. Determining of the sectors for priority activities according to the results of the energy consumption analysis;
4. Elaboration of the CO_2 Baseline Emission Inventory;
5. Elaboration of the Plan of Actions and Measures to achieve the targets set for CO_2 emission reduction by 2020;
6. Determining of the time frame and financial framework, and assessment of investment costs and potentials for energy saving and CO_2 emissions within the measures identified for the buildings, transport and public lighting sectors;
7. Determining of the funding mechanisms for the Action Plan implementation;
8. Establishing of the legislative framework for the Action Plan implementation;
9. Setting targets to reduce energy consumption and associated CO_2 emissions by 2020.
10. Proposing of the measures for the control and monitoring of the Action Plan implementation.

The first activity within the elaboration of the Sustainable Energy Action Plan of the Capital City of Podgorica involves determining of the time frame for its implementation, that is selection of the baseline year for elaboration of the CO_2 Baseline Emission Inventory for specific direct consumption sectors. The timeframe for the Action Plan implementation covers the period from the baseline year until 2020. The baseline year set for the Capital City of Podgorica is 2008, since quality data on energy consumption by sectors are available for that year.

In accordance with the European Commission recommendations, energy consumption sectors in the Capital City of Podgorica have been divided into the following sectors:

- buildings;
- transport;
- public lighting.

Buildings sector is divided into the following three subsectors:

- public buildings and enterprises owned by the Capital City of Podgorica;
- service and commercial buildings in the territory of the Capital City of Podgorica;

- residential buildings.

Transportation sector has three subsectors:

- fleet owned and used by the Capital City;
- public transportation in the territory of the Capital City;
- personal and commercial vehicles.

The public lighting sector covers the public lighting network owned by the Capital City.

Input data for energy consumption analysis in the buildings sector of the Capital City for 2008 are the following:

- the number and floor area of buildings;
- construction and energy characteristics of buildings;
- electricity consumption in buildings;
- energy consumption for heating in buildings;
- types of energy used.

Data required for the energy consumption analysis in transport in the Capital City in 2008 are the following:

- structure and characteristics of the fleet owned and used by the Capital City;
- structure and characteristics of the public transport in the territory of the Capital City;
- the number and structure of registered passenger vehicles and combined vehicles;
- consumption of different types of fuel in the fleet owned by the Capital City;
- distribution and consumption of various types of fuel for bus transport in the territory of the Capital City.

The mileage and the associated consumption of various types of fuel will be estimated based on the number and the structure of registered passenger vehicles and combined vehicles.

Data required for the energy consumption analysis in the public lighting sector of the City are the following:

- structure and characteristics of the public lighting network (the number of lamps, the type and characteristics, the distance between lighting poles, etc.);
- electricity consumption;

We may say that an important, if not even the most important, activity within the Action Plan elaboration is systematic collection and processing of quality data, since the results of energy consumption analysis for specific sectors and subsectors are in fact the input data for the CO_2 Baseline Emission Inventory elaboration.

The next important activity within this Action Plan is the CO_2 Baseline Emission Inventory elaboration that will be done for the Capital City of Podgorica according to the IPCC Protocol. IPCC Protocol for determination of emission of pollutants into the atmosphere is a protocol of the Intergovernmental Panel on Climate Change - IPCC

as the executive body of the United Nations Environment Programme – UNEP and World Meteorological Organization (WMO) regarding the implementation of the United Nations Framework Convention on Climate Change – UNFCCC.

The measures and activities for energy efficiency and the use of renewable energy sources are identified based on the conducted energy consumption analysis in sectors and subsectors in the Capital City and the associated CO_2 emissions in 2008, the energy consumption projections by 2020, as well as other relevant factors. Based on the above stated, the Plan of Measures and Activities (hereinafter referred to as the Plan) is elaborated for the period until 2020, whose implementation will result in realization of the targets set for CO_2 emission reduction.

According to the European Commission recommendations, the Plan of Measures and Activities for Podgorica will include the buildings, transport and public lighting sectors, and the measures may also include the following areas according to the specific situation in the Capital City:

- local energy generation from renewable sources (owned by the Capital City and other energy companies);
- city land use planning (urban planning, transport infrastructure development planning, planning of the projects for the construction and reconstruction of buildings in accordance with the sustainable construction standards);
- green public procurement (inclusion of the energy efficiency and renewable energy sources requirements into the public procurement process in the Capital City);
- work with citizens and stakeholders on educating, raising awareness and their active involvement into the sustainable energy city development (forming energy counseling centers and info centers, creating financial mechanisms for the support of physical persons in initiation of energy efficiency projects, use of renewable energy sources and environment protection, organizing promotional and informative activities, public polls etc.).

The following will be specified for each identified measure and activity in the Plan:

- potential energy savings by 2020;
- timeframe and dynamics of implementation;
- financing possibilities;
- investment costs of implementation;
- potential to reduce CO_2 emission by 2020.

An important activity of the Action Plan is to establish a legislative framework. All proposed measures and activities in this Plan are in accordance with the relevant legislation at the Capital City, Montenegro and the European Union level.

The last step in the Action Plan elaboration is to set up a realistic target to reduce CO_2 emission by 2020 based on all implemented activities, as well as the targets for emission reduction by individual sectors and subsectors of energy consumption in the territory of the Capital City.

2.4. Approval of the Action plan as an implementation document of the Capital City of Podgorica

Approval of the Action Plan as an official implementation document of the Capital City of Podgorica is a key element for its realization, and achievement of the CO_2 emission reduction until 2020. For that reason, it is important to involve the management of the City Administration in the process of elaboration, implementation and monitoring of the Action Plan from the very beginning, on one side, and to establish the Energy Council as one of the first steps, to be the most responsible authority to assess and approve the final document and further monitor its implementation, on the other side.

2.5. Implementation of the plan of measures and activities for the Capital City of Podgorica

Implementation of the identified energy efficiency measures which will ensure reaching of the target for CO_2 emission reduction by over 20% by 2020 is the most difficult phase of the Action Plan because of the necessary time and effort, and the required funds. The plan of measures and activities includes the identified energy efficiency measures, the time frame and the dynamics realization, and the assessment of energy savings and the associated CO_2 emission reduction.

Adoption of the Action Plan as an official document is the beginning of its implementation, that needs to be understood as a very complex task and whose implementation largely depends on many ownership, social, economic and technical factors. Successful realization requires exceptionally good organization and cooperation between many stakeholders in the territory of the Capital City.

The first step in the Action Plan implementation is forming of the Working Group for its implementation (hereinafter the Working Group) and appointment of its leader. The basic task of the Working Group is to coordinate the entire complex process of the Action Plan implementation. The first precondition for successful coordination is preparation and implementation of an effective communication strategy at two levels. The first level is to ensure continuous information flow and communication between the City authorities and services, i.e. all persons involved in the specific energy efficiency projects, as well as the persons responsible for their realization in accordance with the Plan (designers, engineers and others). The second level includes sharing information with the citizens and stakeholders on all activities within the Plan implementation. In order to achieve successful implementation of the Action Plan, it is very important to have good communication along with appropriate experience and expertise of the Working Group members.

2.6. Monitoring and control of the Action Plan implementation

The monitoring and control phase in the Action Plan implementation is to be carried out at several levels in parallel:

- Monitoring the dynamics of the implementation of specific energy efficiency measures under the Plan of measures and activities;
- Monitoring successful implementation of projects according to the Plan;
- Monitoring and control of the energy saving targets set for each measure within the Plan;
- Monitoring and control of CO_2 emission reduction achieved for each measure within the Plan.

Monitoring the dynamics and success of the implementation of the Plan of Measures and Activities will be done by the Energy Council.

The only successful way to monitor the savings achieved in different sectors and their subsectors, as well as to meet the targets set to reduce CO_2 emissions both for each individual measure and for the implementation of the entire Plan, is the elaboration of a new CO_2 Monitoring Emission Inventory for the Capital City. According to the recommendations of the European Commission, the best results of the entire process of elaboration, implementation and monitoring of the Action Plan would be achieved by creating a new CO_2 Monitoring Emission Inventory every two years, and it is very important that the methodology of its elaboration is identical to the methodology used to create CO_2 Baseline Emission Inventory for 2008. Application of the same methodology for elaboration of the Inventories allows their comparison and a final answer to the question whether the targets set for CO_2 emission reduction are achieved. It is assumed that even better results would be achieved if elaboration of a new inventory would be accompanied with elaboration of a new Action Plan, which would include analysis of the achieved results (measures implemented, savings achieved, CO_2 emission reduction), as well as a draft new plan of activities and measures based on the specific results and data from the CO_2 Monitoring Emission Inventory for the current year. It is also important to use the same methodology in elaboration of the new Action Plan, so that all results are comparable.

2.7. Reporting on the achieved results in the Action Plan implementation

Through accession to the Covenant of Mayors, the cities committed to develop Sustainable Energy Action Plans and report continuously to the European Commission on the dynamics and effectiveness of its implementation every two years. The European Commission has prepared and published the forms to enter the main parameters of the Action Plan (the person responsible, energy consumptions and CO_2 emissions according to the EC sector classification, identified measures for energy efficiency, targets set etc.). The completed forms are to be sent to the European Commission, which will provide its official opinion and possible comments for improvement of the Action Plan to the person responsible in the city administration upon their reviewing and assessment.

2.8. Organizational structure of the process of elaboration, implementation and monitoring of the Sustainable Energy Action Plan of the Capital City of Podgorica

2.8.1. Working and supervision bodies for the process implementation

The process of elaboration, implementation and monitoring of the Sustainable Energy Action Plan of the Capital City of Podgorica is a very complex task characterized by many challenges for its participants. The European Commission has provided a framework guidebook on the entire process, however it is up to the city administration to adapt it to the specific situation in the Capital City as much as possible, which is not an easy task.

The main precondition for successful realization of the elaboration process is to build an effective organizational structure clearly defining from the very beginning of the process who does what, how and in what time frame. It was very important to form at the very beginning all the working and supervision bodies and to define clear tasks.

The first step in establishing the organizational structure to implement the process was to appoint the coordinator. The coordinator of the elaboration process is the key person who makes all important decisions and who gives the proposal for the establishment of all the working and supervision bodies necessary to implement the above stated basic steps in the process.

In order to realize and control implementation of the activities defined in the Action Plan, it is necessary to establish:

- the Energy Council;
- the Working Group for the Action Plan implementation.

The Energy Council is the supervision and advisory body that should be established in order to achieve good communication between all stakeholders and evaluation of the final document and monitoring of the entire implementation process. The Energy Council should consist of the representatives of the city administration, the main shareholders in the elaboration process, as well as eminent experts in the energy industry that have experience in the field of energy planning, spatial development and construction, transport and utility infrastructure.

The main tasks of the Energy Council are as follows:

- evaluation and approval of documents;
- communication with the stakeholders and citizens;
- monitoring of the activities of the Working Group for the implementation of the plan of priority measures and activities;
- monitoring and control of the implementation of the plan of priority measures and activities;
- periodical reporting on the results of the Action Plan implementation;

- review of the report on the results of the Action Plan implementation for the European Commission;
- approval of the report on the results of the Action Plan implementation for the European Commission.

Working Group for the Action Plan implementation is primarily responsible for initiating and coordinating of the implementation of specific projects and measures for energy efficiency, renewable energy sources and environmental protection in accordance with the timetable and schedule of the plan of measures and activities.

The main tasks of the Working Group include the following:

- management and coordination of the overall implementation of the plan of measures and activities in accordance with the decisions of the Energy Council;
- establishing communication strategy;
- implementation of tenders for the project documentation development for projects and measures within the Plan;
- implementation of tenders for contractors for projects and measures within the Plan;
- implementation of tenders for the necessary equipment for projects and measures within the Plan;
- implementation of projects and measures within the Plan;
- preparation of periodical reports on the results of the Plan implementation.

The Working Group will consist of the representatives of the following authorities and services of the Capital City:

- the Secretariat for Planning, Spatial Development and Environment Protection
- the Secretariat for Utilities and Transport
- the Housing Agency
- the Agency for Construction and Development of Podgorica
- PE Water Supply and Sewage Management
- PE Utilities.

2.8.2. Identification and involvement of stakeholders

The process of elaboration and implementation of the Action Plan is a complex task that should include from the start as many stakeholders as possible, which requires effective communication strategy and includes identification and involvement of stakeholders at the very beginning of this process.

The mentioned stakeholders from the territory of the Capital City may be divided into the following categories:

- City authorities and services;
- local communities;
- the Chamber of Commerce of Montenegro;
- the Employers' Federation;

- the Business Alliance;
- the Auto-Moto Association of Montenegro;
- the University of Montenegro;
- NGOs;
- consumer associations.

Administration authorities were formed and special services and other types of services were established according to the competences within the Capital City.

Technical services were organized, such as the Mayor's Service, the Chief Administrator's Service, the Manager's Service and the General Service. Administration authorities of the Capital City were established as secretariats, administrations and directorates, as follows: the Secretariat for the Local Self-Government, the Secretariat for the Finances, the Secretariat for Planning and Spatial Development and Environment Protection, the Secretariat for Utilities and Transport, the Secretariat for Entrepreneurship Development, the Secretariat for Social Welfare, the Secretariat for Culture and Sports, the Administration for Local Public Revenues, and the Property Directorate.

Individual administration authorities are run by their managers – secretaries or directors. Special services, performing specific affairs within the Capital City, are: Municipal Police, Protection Service, Information System Center and the Internal Audit Service. The following are also established and operate within the Capital City: the Agency for Construction and Development of Podgorica, the Housing Agency, along with 5 public enterprises, 10 public institutions and 4 limited liability companies.

With the aim to create the conditions to have as direct and efficient operation of the local self-government as possible and in order to meet certain common needs and interests of the citizens in the territory of the Capital City, 57 local communities were established, out of which 23 in the central city area and 34 in the suburban area.

The most significant industry branches in the territory of the Capital City of Podgorica are aluminum production and production of wine and liquors. The stated activities are performed by the public limited companies Aluminum Plant Podgorica (*Kombinat aluminijuma Podgorica*) and Plantaže, which are not owned by the Capital City. Among other significant entities there are: Railway Transport of Montenegro (*Željeznički prevoz Crne Gore AD Podgorica*), Railway Infrastructure (Želj*eznička infrastruktura AD Podgorica*), and PE Airports of Montenegro (*JP Aerodromi Crne Gore*).

In the territory of Podgorica, there are 29 elementary and 11 high schools. As regards higher education institutions, out of 20 universities within the University of Montenegro, 12 of them are located in the Capital City, as well as 2 independent study programmes. Also, there are two private faculties in Podgorica which include 10 study programmes. Education institutions are not owned by the Capital City, that is they are not its integral part.

The head seat of the Chamber of Commerce of Montenegro is located in the Capital City, and it includes a number of associations in various fields, such as construction, transport, trade, small and medium enterprises, tourism, energy and mines, metal industry and so on. Apart from the stated, other important associations include the Employers' Federation of Montenegro, the Business Alliance and the Auto-Moto Association of Montenegro.

According to the available data, there are fourty organizations operating in the territory of the Capital City dealing with, among other, environment protection, although it may be assumed that only certain NGOs deal with this matter actively.

3. Analysis of energy consumption in the buildings sector of the Capital City of Podgorica in 2008

For the needs of energy consumption analysis, the buildings sector of the Capital City of Podgorica is divided into the following subsectors:

- buildings and enterprises owned by the Capital City;
- residential buildings;
- commercial and service buildings.

Relevant data for the energy consumption analysis in the buildings sector are collected from the following sources:

- city services, enterprises and companies as users of buildings owned by the Capital City;
- General Service of the Capital City;
- Secretariat for the Local Self-Government;
- Preliminary energy reviews (three buildings owned by the Capital City);
- Statistical Office of Montenegro – MONSTAT (official publications);
- Energy Management Company of Montenegro – Energy Distribution; Podgorica (*Elektroprivreda Crne Gore –Elektrodistribucija Podgorica*);
- PI “Water Supply and Sewage Management” (J.P. "Vodovod i kanalizacija");
- PI "Čistoća".

Depending on their reliability, data may be divided into two categories:

- Reliable data – data obtained by collecting bills for the buildings in specific subcategories
- Estimated data – due to lack in the required data, they were estimated based on the experience, by adopting specific parameters for estimates**.**

Based on the collected data, the following parameters were specified for all individual building subsectors of the Capital City of Podgorica:

- general subsector data;
- total subsector area;
- number of subsector buildings;
- total subsector electricity consumption;
- specific subsector electricity consumption;
- total natural gas consumption;
- specific subsector natural gas consumption;
- total subsector heating oil consumption;
- specific subsector heating oil consumption;
- total subsector wood consumption;
- specific subsector wood consumption;
- total subsector thermal energy consumption (heating and cooling);
- specific subsector thermal energy consumption (heating and cooling).

3.1. Analysis of energy consumption in the residential and public buildings subsector owned by the Capital City of Podgorica in 2008

3.1.1. Division of residential and public buildings owned by the Capital City of Podgorica

The residential and public buildings subsector owned by the Capital City of Podgorica is divided into the following categories:

- city administration;
- local self-government;
- cultural institutions;
- apartments and office premises owned by the Capital City;
- enterprises owned by the Capital City;
- companies owned by the Capital City;
- other buildings.

Division into the mentioned categories was done in order to get the best and the most precise insight into the actual thermal (heating and cooling) and electrical energy consumption in the residential and public buildings subsector owned by the Capital City. The division is fully in accordance with the European Commission recommendations for elaboration of the Action Plans for city development.

Most buildings owned by the City use exclusively electricity as energy, both for heating and cooling and for other purposes as well (lighting and operation of other devices and appliances). Since there are no reliable data on the quantity of electricity consumed for heating/cooling or other purposes, estimates were done based on the experience and the parameters obtained for the City of Zagreb as comparable parameters. For that reason, specific electricity consumption for other purposes was estimated for each individual category of buildings (specific electricity consumption factor for the City of Zagreb for other purposes ranges between 40 - 50 kWh/m^2 depending on the subsector), and the specific consumption for heating/cooling was obtained as the difference between the total specific consumption and the specific consumption for other purposes.

3.1.2. City administration

The Capital City of Podgorica has 10 buildings for city administration, with the total surface area of 18,158.6 m^2 which consumed 1,934,671 kWh in 2008. Since all administrative buildings use electricity for heating, the share of electricity used for lighting and electrical devices was estimated based on experience.

Specific electricity consumption for other purposes (lighting and operation of other electrical devices and appliances) was estimated at 40 kWh/m^2, which gives the total consumption of 726,344 kWh.

The total energy consumption for heating/cooling in the city administration buildings is 1,208,327 kWh, which gives the specific consumption of 66 kWh/m^2.

It was suggested that detailed energy inspections should be conducted before taking specific measures in order to reduce energy consumption in the buildings. By doing that, the Capital City of Podgorica would show on its own example, apart from realizing energy and economic saving, the commitment to responsible and sustainable energy management and it would also give a positive example and encourage other entities in the city to start regular monitoring and management of energy consumption in the buildings they own.

3.1.3. Local self-government

Consumption analysis of the buildings of the Capital City of Podgorica local self-government included 40 local self-government buildings (in most cases, those were parts of buildings), namely: 16 in city communities, with the total area of 2,601 m^2; 4 in suburbs with the total area of 1,379 m^2**,** and 20 in rural communities with the total area of 5,620 m^2.

The Capital City of Podgorica has 57 local communities, and the data were analyzed for 40 of them, since we do not have consumption data for certain local communities in the rural area (the premises are seldom used, or not used at all, so that their energy consumption is not significant) or the local community used some joint premises in 2008 (in most cases those were parts of buildings). For the local communities that do not have precise consumption data, and which are included in the analysis, we conducted energy consumption estimates based on the consumption of other local communities used under a similar regime. Due to different regimes, there were notably different energy consumptions.

All buildings of local communities use solely electricity as energy (both for heating/cooling and for other purposes).

Due to different electricity consumption in certain local community buildings, assessment was not done in accordance with the specific consumption factor (explained previously), but it was assumed that 40% of the total electricity consumed is spent for other purposes (lighting and operation of other electrical devices and appliances), and the remaining 60% is spent on heating/cooling.

Since the total electricity consumption for the local community category amounted to 199,355 kWh in 2008, the assumption is that 60% was spent on heating/cooling, which equals to electricity consumption of 119,613 kWh, that is, specific consumption of 12.46 kWh/m^2. 40% of electricity was spent for other purposes, i.e. 79,742 kWh, so that specific consumption is 8.3 kWh/m^2.

Electricity and thermal energy consumption (heating/cooling) in the local community buildings is different, depending o the use and purpose of the building, and it is within the expected limits for buildings used in similar regime. Recommendation for this type of buildings is also to start implementation of energy inspections prior to implementation of specific measures.

3.1.4. Cultural institutions

The Capital City of Podgorica owns 10 buildings belonging to the category of cultural institutions, with the total area of 6,123 m². In 2008, this category of institutions spent the total of 555,049 kWh electricity, used for heating/cooling and other purposes, 9 t of heating oil, 1,182 m^3 natural gas and 140 m^3 wood.

A portion of electricity is used for heating and cooling of buildings, and another portion for other purposes (lighting and operation of electrical devices and appliances). Using data for the City of Zagreb as comparable ones, we estimated the specific electricity consumption for other purposes for the category of cultural institutions amounting to 45 kWh/m^2, i.e. 275,554 kWh, so that electricity consumption for heating and cooling is 279,494 kWh.

Table 3.1 shows parameters for thermal energy consumption per energy type in the category of cultural institutions in the Capital City of Podgorica, as well as the specific thermal energy consumption.

Table 3.1 Thermal energy consumption parameters in cultural institutions in the Capital City of Podgorica

Energy type	Total heated/cooled area (m^2)	Thermal energy consumption (kWh)	Specific consumption (kWh/m^2)
Heating oil		105,000	
Natural gas		11,000	
Electricity		279,494	
Wood		161,000	
Total	6,123	556,494	90.89

Structure of energy types used for heating of the stated institution category of the Capital City of Podgorica is presented in Figure 3.1.

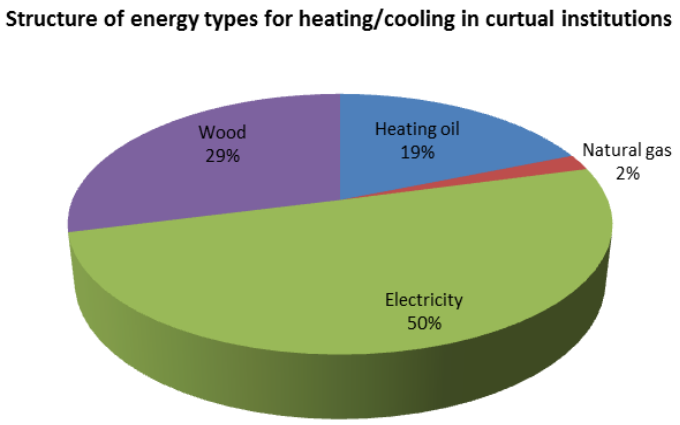

Figure 3.1 Structure of energy types used for heating and cooling in cultural institutions in the Capital City of Podgorica

We can conclude from the conducted energy analysis in the category of cultural institutions of the Capital City of Podgorica that thermal energy consumption is as expected and characteristic for buildings used for such purpose. Regarding thermal energy consumption per energy type, the most consumed type is electricity (about 50%), and wood (about 30 %), while thermal energy consumption from heating oil and natural gas is about 20%.

3.1.5. Apartments and office premises owned by the Capital City of Podgorica

Analysis of energy consumption in the category of apartments and office premises owned by the Capital City of Podgorica covered 203 buildings in total, with the total area of 25,334.11 m². (As regards the apartments owned by the Capital City, only buildings where the Capital City of Podgorica is the owner of the entire building were covered. The situation is different for office premises, because they are only parts of buildings which are not owned entirely by the Capital City of Podgorica).

The category of apartments and office premises spent 3,449,727 kWh electricity in 2008 in total, (since consumption data for this category were not available, the consumption was estimated according to the specific energy consumption of similar building categories in this document). Using the experiences of the City of Zagreb, we estimated the specific electricity consumption for other purposes (lighting and operation of other electrical devices and appliances) for the category of apartments and office premises of the Capital City of Podgorica in the amount of 50 kWh/m^2, i.e. 1,266,706 kWh.

All apartments and office premises in the Capital City of Podgorica have heating and cooling with electricity. Total thermal energy consumption of apartments and office premises owned by the Capital City is 2,183,022 kWh, which equals to specific consumption of 86.17 kWh/m^2.

3.1.6. Enterprises owned by the Capital City of Podgorica

The Capital City of Podgorica owns 7 enterprises – J.P. "Vodovod i kanalizacija" (Water Supply and Sewage Management), Centar za smještaj rehabilitaciju i resocijalizaciju korisnika psihoaktivnih supstanci "Kakaricka gora" (Center for Placement, Rehabilitation and Resocialization of Drug Addicts "Kakaricka gora"), J.P. Zelenilo (PI Management of Green Areas), JP "Pogrebne usluge" (PI Funeral Services), J.P. "Čistoća" (PI Waste Management), J.P. "Komunalne usluge" (PI Municipal services) and J.P. "Sportski objekti" (PI Sport Facilities), with 18 buildings in total, covering the total area of 15,440.31 m².

The category of enterprises owned by the Capital City of Podgorica spent 2,401,858 kWh electricity in total in 2008, for heating/cooling and other purposes, 30 t heating oil and 20 m^3 wood. Specific electricity consumption depends on the activity performed in individual buildings. Using the experiences of the City of Zagreb, we estimated the specific electricity consumption for other purposes for the category of enterprises owned by the Capital City of Podgorica in the amount of 60 kWh/m^2, i.e. 926,418 kWh, so that consumption of electricity as thermal energy is 1,475,439 kWh.

Table 3.2 shows parameters for thermal energy consumption in the category of enterprises owned by the Capital City of Podgorica.

Table 3.2 Thermal energy consumption parameters in enterprises owned by the Capital City of Podgorica

Energy type	Total heated/cooled area (m^2)	**Thermal energy** consumption (kWh)	Specific **thermal** energy consumption (kWh/m^2)
Heating oil		350,000	
Electricity		1,475,439	
Wood		23,000	
Total	15,440	1,848,439	119.72

3.1.7. Companies owned by the Capital City of Podgorica

The Capital City of Podgorica owns 6 companies - *Putevi d.o.o., Agencija za stanovanje d.o.o., Agencija za izgradnju i razvoj d.o.o., Deponija d.o.o., Tržnice i pijace and Parking Servis d.o.o.* (Roads, Housing Agency, Agency for Construction and Development, Landfill, Markets and Parking Service), with the total of 12 buildings, covering the total area of 10,635.6 m².

The category of companies owned by the Capital City of Podgorica spent 1,671,873 kWh of electricity in total in 2008. Electricity is used as the only energy type, for heating/cooling and for other purposes. Using the experiences of the City of Zagreb, we estimated the specific electricity consumption for other purposes for the category of companies owned by the Capital City of Podgorica in the amount of 60 kWh/m^2, i.e. 638,136 kWh.

All buildings in the category of companies owned by the Capital City of Podgorica have heating and cooling with electricity. When we subtract electricity consumption

for other purposes from the total consumption of this category, the total thermal energy consumption of companies owned by the Capital City is 1,033,737 kWh, which equals to specific consumption of 86.17 kWh/m^2.

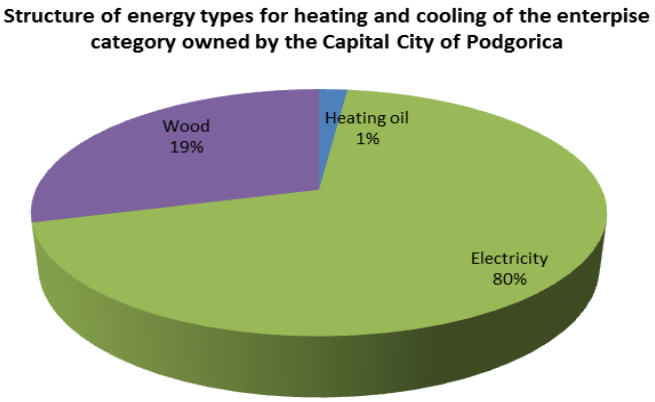

Figure 3.2 Structure of energy types for heating and cooling of the enterprise category owned by the Capital City of Podgorica

3.1.8. Other buildings owned by the Capital City of Podgorica

The Capital City of Podgorica also owns the building of the Court building and SDC Tološi, with the total area of 3,115.6 m², which spent 272,727 kWh electricity in total in 2008. Electricity is used as the only energy type, for heating/cooling and for other purposes (lighting and operation of other devices and appliances). For this category of buildings, we estimated that the specific electricity consumption for other purposes is 40 kWh/m^2, i.e. 124,624 kWh.

Both buildings have heating and cooling with electricity, so that the total thermal energy consumption in other buildings owned by the Capital City is 148,103 kWh, which equals to specific consumption of 47.55 kWh/m^2.

3.2. Analysis of energy consumption in the buildings subsector owned by the Capital City of Podgorica

Analysis of electricity and thermal energy consumed in 2008 covered the categories described in the previous chapters within the buildings subsector owned by the Capital City of Podgorica:

- city administration buildings;
- local self-government buildings;
- cultural institutions buildings;
- apartments and office premises;
- city enterprises buildings;
- company buildings;

- other buildings.

The buildings sector owned by the Capital City of Podgorica spent 4,037,524 kWh electricity for other purposes in 2008, which equals to specific electricity consumption of 45.67 kWh/m^2.

The buildings sector owned by the Capital City of Podgorica spent 7,097,735 kWh of thermal energy in 2008, which equals to specific thermal energy of 80.29 kWh/m^2.

Since the buildings subsector, owned by the Capital City of Podgorica, uses mostly electricity (about 95%, Figure 3.5.) and since there are no separate precise data on the share of electricity spent for heating/cooling and for other purposes, the best figure for comparison of specific consumption for individual categories is the total specific energy consumption. Comparison of the total specific energy consumption per category is presented in the chart in Figure 3.3.

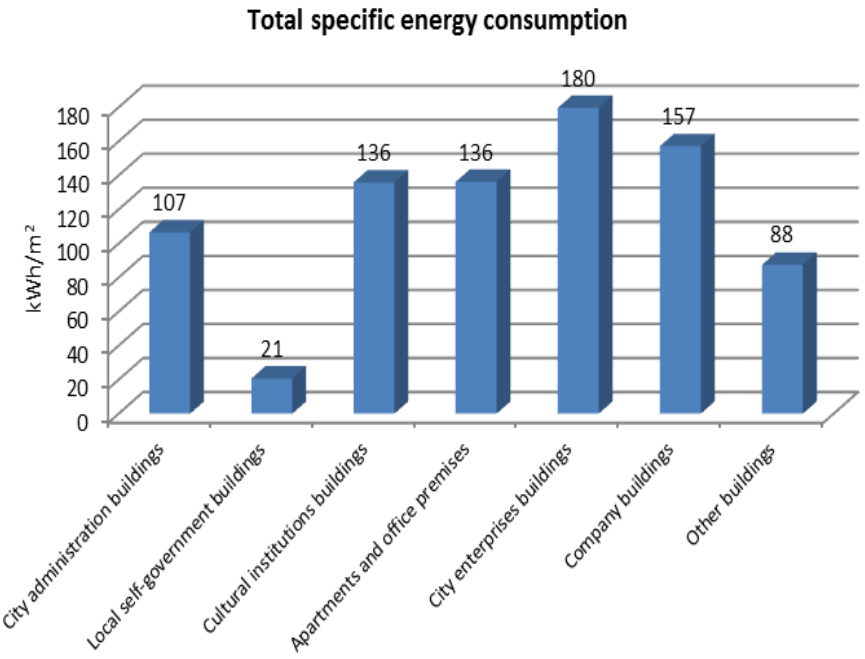

Figure 3.3 Comparison of the specific total energy consumption in the subsector of buildings owned by the Capital City per category

Comparison of the total specific energy consumption clearly shows that specific consumption for the city enterprises buildings category is higher than in other category of buildings owned by the Capital City of Podgorica.

Structure of total energy consumption per category is presented in Figure 3.4.

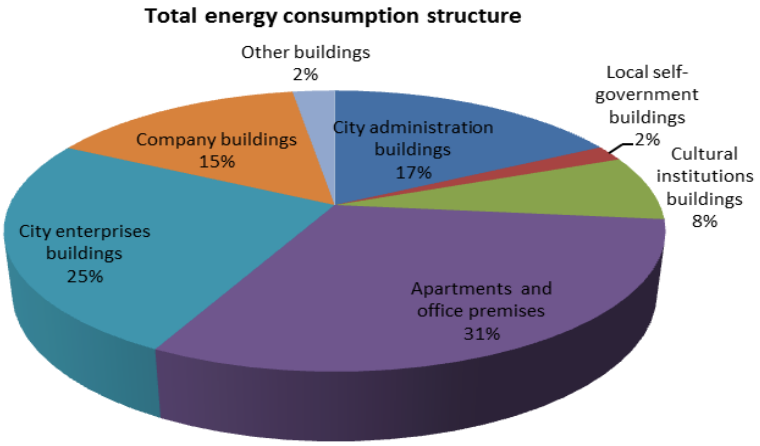

Figure 3.4 Total energy consumption structure in the subsector of buildings owned by the Capital City of Podgorica

As presented in Figure 3.4, the largest share in the total energy consumption in the subsector of buildings owned by the Capital City of Podgorica belongs to the apartments and office premises category (31%), followed by city enterprises buildings category (25%), while the rest share in the consumption belongs to the city administration buildings category (17%), company buildings (15%), cultural buildings (8%), local self-government buildings (2%) and other buildings (2%).

The share of certain energy types in the total energy consumption in the subsector of buildings owned by the Capital City of Podgorica is shown in the chart in Figure 3.5.

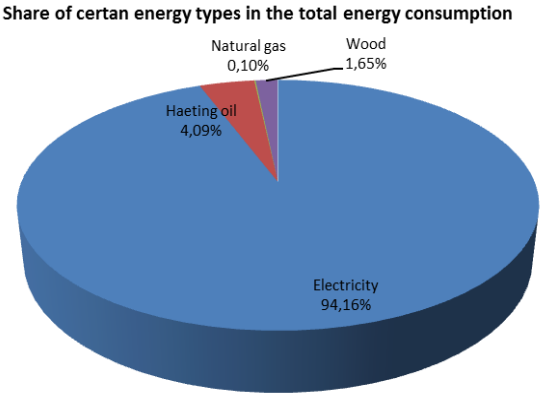

Figure 3.5 Share of certain energy types in the total energy consumption in the subsector of buildings owned by the Capital City of Podgorica

The most significant energy type in the subsector of buildings owned by the Capital City of Podgorica is electricity with the highest share in consumption (94%), followed by heating oil, wood and natural gas (6%). Electricity as energy type is used in most buildings owned by the Capital City of Podgorica for heating/cooling and other purposes.

The energy analysis conducted in the subsector of buildings owned by the Capital City of Podgorica for 2008 shows that all categories of buildings owned by the Capital City have high potential for savings both in electricity and thermal energy.

3.3. Analysis of energy consumption in the residential sector in the territory of the Capital City of Podgorica in 2008

Total area of buildings in the residential sector of the Capital City of Podgorica in 2008 was 3,646,490 m^2. Using data from the official publications of the Statistical Office of Montenegro (the last census was done in 2003), it was estimated that the number of residential units in Podgorica was 52,093 in 2008.

The residential sector of the Capital City of Podgorica spent 426,609,864 kWh electricity in 2008 (Electricity Distribution Company – household category) and 46,440 m^3 wood (estimate based on the Monstat data and other available data). In the households subsector of the Capital City of Podgorica there are no separate precise data on the share of electricity consumption for heating/cooling and for other purposes, and the quantity of thermal energy consumed was estimated based on the area of buildings that have heating with wood. Specific energy consumption for heating in households using wood as energy type is 98 kWh/m^2. Equal value is estimated for specific thermal energy consumption.

According to the above stated model, specific electricity energy consumption in the households subsector for the category of other consumption (lighting and operation of electrical devices and appliances in households) is 33 kWh/m^2, i.e. 120,576,156 kWh.

Table 3.3 shows parameters for thermal energy consumption in the residential sector of the Capital City of Podgorica.

Table 3.3 Thermal energy consumption parameters in the residential sector of the Capital City of Podgorica

Energy type	Total heated/cooled area (m^2)	Thermal energy consumption (kWh)	Specific thermal energy consumption (kWh/m^2)
Electricity	3,104,690	306,033,708	98.57
Wood	541,800	53,406,000	98.57
Total	3,646,490	359,439,708	98.57

Total thermal energy consumption in the households subsector of the Capital City of Podgorica is 359,439,708 kWh, which equals to specific thermal energy consumption of 98.57 kWh/m^2. Figure 3.6 shows use of individual energy types for heating/cooling in households.

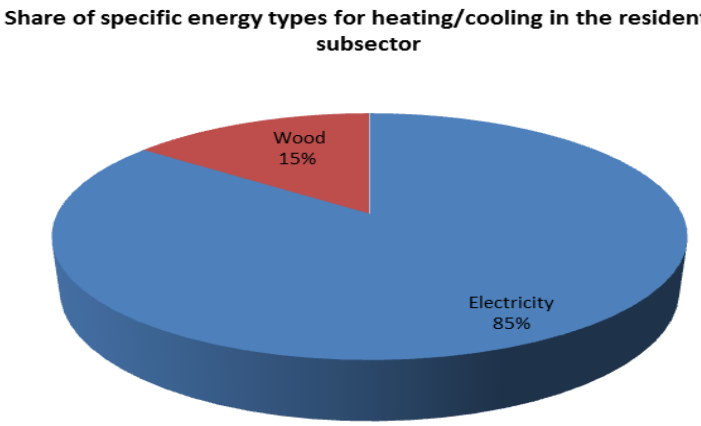

Figure 3.6 Share of specific energy types for heating/cooling in the residential sector of the Capital City of Podgorica

Analysis of energy consumption in the residential subsector of the Capital City of Podgorica shows potential for energy saving, in particular electricity saving and thermal energy saving in buildings that use wood for heating. Buildings that use wood for heating are often in relatively poor condition, without thermal protection of external walls, with poor windows and doors, and they use old wood furnaces. It is clear that the existing residential units spend significantly more energy and that it will be necessary to take many energy efficiency measures in order to rationalize consumption and to reach the final target, that is CO_2 emission reduction by over 20% by 2020.

3.4. Analysis of energy consumption in the subsector of commercial and service activities in the territory of the Capital City of Podgorica in 2008

The subsector of commercial and service activities cover about 3,819 buildings with the total area of 851,132.22 m^2 (used data base of PI ‘’Čistoća’’, where it is not easy to determine precise identification according to the activity. Areas of buildings owned by the Capital City and the industry sector were excluded).

The subsector of commercial and service activities of the Capital City of Podgorica spent 124,008,572 kWh electricity in 2008 (used data on electricity consumption from the Electricity Distribution - *Elektrodistribucija* Podgorica, also lacking clear categorization for the sector of commercial and service activities). According to the data, all buildings in the subsector of commercial and service activities use electricity for heating and cooling, but there are no precise separate data on the share of electricity consumed for heating/cooling and for other purposes. For that reason, we estimated specific electricity consumption for other purposes amounting to cca 50 kWh/m^2 . Therefore, total electricity consumption for other purposes (lighting and operation of electrical devices and appliances) in the City of Podgorica for the sector of commercial and service activities is 42,556,611 kWh.

All buildings in the subsector of commercial and service activities of the Capital City of Podgorica use solely electricity as thermal energy. Total thermal energy consumption is 81,451,961 kWh, which equals to specific thermal energy consumption of 96 kWh/m^2.

Analysis of the energy consumption in the commercial and service subsector of the Capital City of Podgorica shows potential for energy saving of electricity used as the sole energy type, as well as possibility of replacement of the energy type for heating. To that regard, it is necessary to take numerous energy efficiency measures in order to rationalize consumption and to reach the final target - CO_2 emission reduction by over 20% by 2020.

3.5. Conclusion

According to the results of the energy analysis conducted in the buildings sector of the Capital City of Podgorica, most energy is consumed in the residential subsector, followed by the subsector of commercial and service activities and finally in the buildings owned by the City (Figure 3.7).

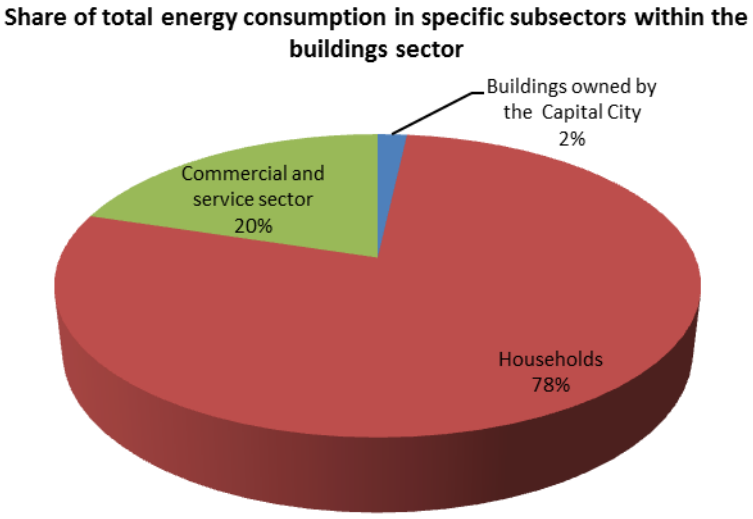

Figure 3.7 Structure of energy consumption in the buildings sector per subsectors

Share of individual subsector in the total electricity and thermal energy consumption in the buildings sector is shown in Figures 3.8 and 3.9.

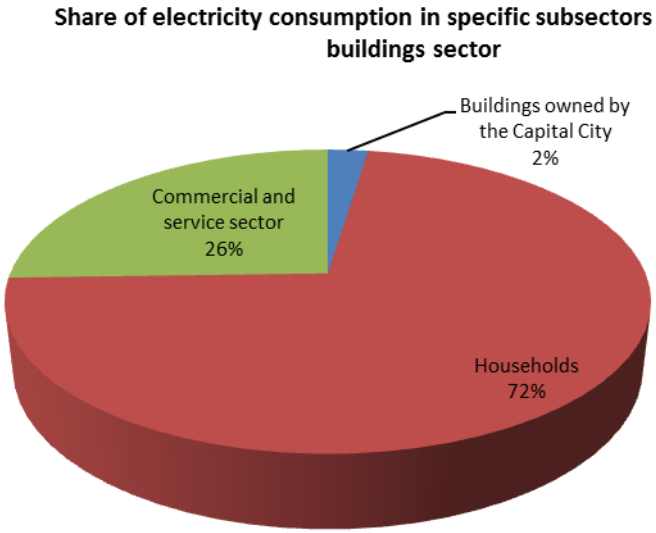

Figure 3.8 Structure of electricity consumption per individual subsector within the buildings sector

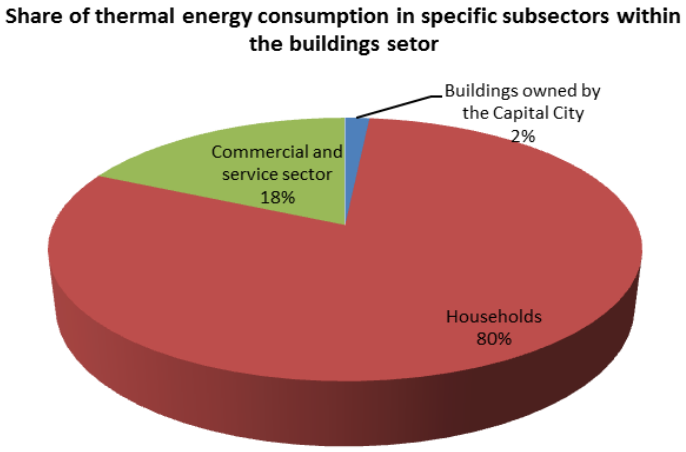

Figure 3.9 Structure of thermal energy consumption per subsector within the buildings sector

Figure 3.10 shows comparison of specific total energy consumption in the buildings sector per individual subsector.

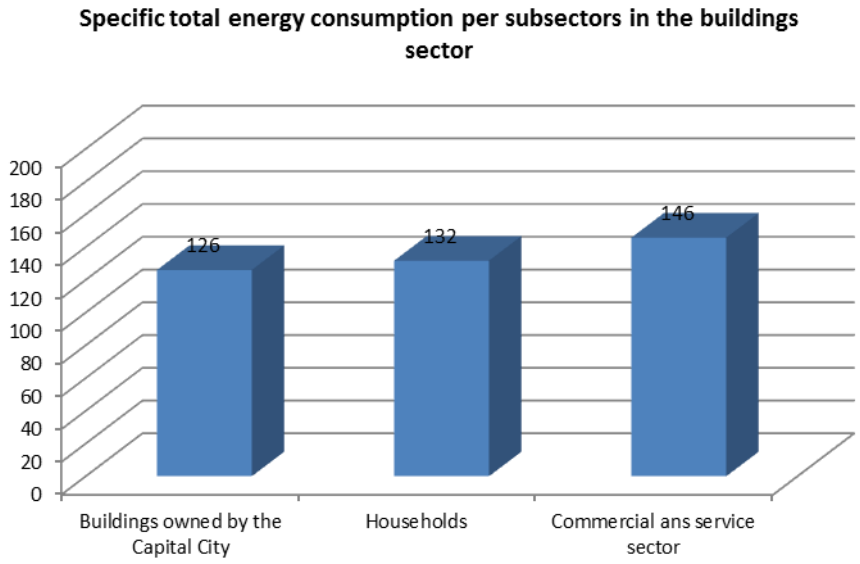

Figure 3.10 Comparison of specific total energy consumptions in the buildings sector

All three subsectors have almost the same specific consumption within the total energy consumption, so that implementation of energy efficiency measures in all three subsectors will be very important in order to reach the CO_2 emission reduction target by over 20% by 2020. There is significant potential for energy saving in all subsectors, so that the measures for the reduction of electricity consumption are equally important for the overall reduction in energy consumption, both in the buildings sector and for reduction of the overall energy consumption in the Capital City of Podgorica.

Figure 3.11 shows the structure of energy consumption in the buildings sector per subsectors.

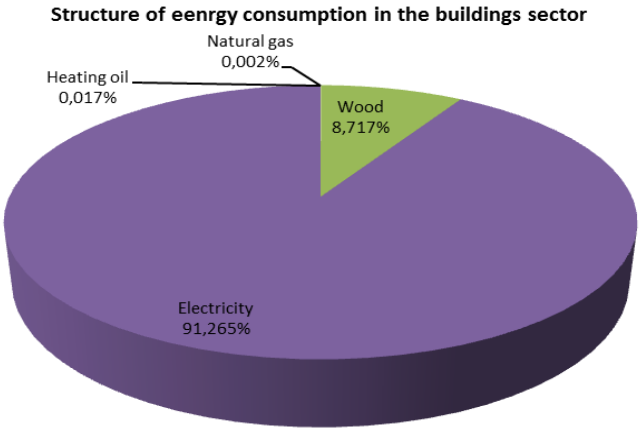

Figure 3.11 Structure of energy consumption in the buildings subsector per energy type

As shown in Figure 3.11., the highest share in energy consumption in the buildings sector belongs to electricity (91%), while wood is used significantly less (about 9%), and the remaining share in consumption (less than 1%) belongs to natural gas and heating oil (estimate of other energy types, since there are no official data on their use, and we know from experience that they are used in a very low percentage).

The principal conclusion of the energy analysis conducted in the buildings sector of the Capital City of Podgorica is that implementation of various energy efficiency measures can result in significant energy saving, and thus contribute to environment protection due to more rational use of resources.

A detailed overview of measures whose implementation would result in significant reduction in electricity and thermal energy consumption in subsectors of the buildings sector in the Capital City of Podgorica is presented in Chapters 7 and 8.

4. Analysis of energy consumption in the transport sector of the Capital City of Podgorica in 2008

For the purpose of energy consumption analysis, the transport sector of the Capital City of Podgorica is divided into the following subsectors:

- Fleet owned by the Capital City;
- Public transport in the Capital City;
- Private and commercial vehicles.

Relevant data for analysis of fuel consumption in the transport sector were collected from the following sources:

- Ministry of Interior and Public Administration;
- Railway Transport of Montenegro (*Željeznički prevoz Crne Gore ad Podgorica*);
- City transport companies;
- Taxi associations;
- Secretariats and services of the Capital City;
- Public institutions;
- Public enterprises;
- Statistical Office MONSTAT.

Based on the collected data, the following parameters were determined for all subsectors of transport sector of the Capital City of Podgorica:

- General subsector data;
- Fleet structure according to vehicle use;
- Classification of vehicles according to the type of fuel used;
- Consumption of various types of fuel per subsector and categories of vehicles within the sector.

4.1. Fleet owned by the Capital City of Podgorica

Fleet owned by the Capital City of Podgorica includes municipal vehicles and vehicles used by specific public enterprises. The total number of vehicles owned by the Capital City is 340.

The total number of municipal vehicles owned by the Capital City including city municipalities of Golubovci and Tuzi is 209, while the number of commercial vehicles is 131 (Figure 4.1.).

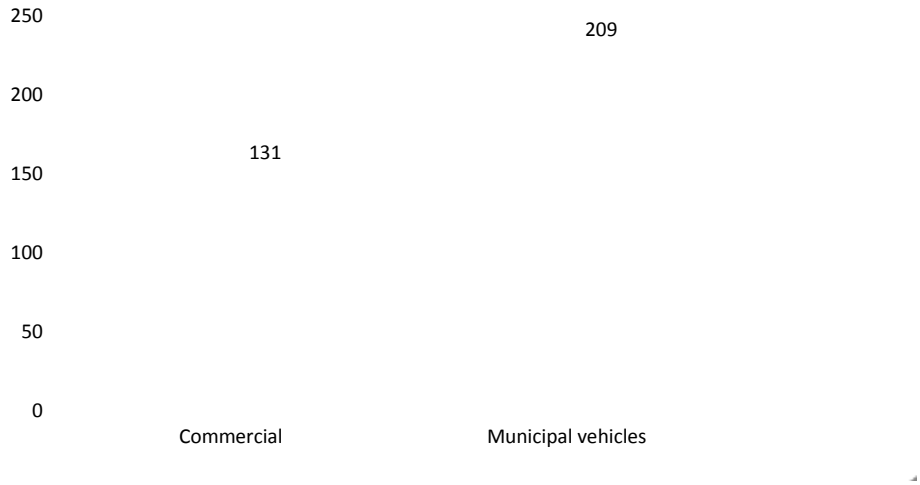

Figure 4.1 Total number and structure of vehicles owned by the Capital City

Having in mind the type of activity of enterprises such as PI Landfill (*JP Deponija)*, PI Municipal Waste Management (*JP Čistoća)*, PI Water Supply and Sewage (*JP Vodovod i kanalizacija)*, PI Green Areas Management (*JP Zelenilo)*, as well as the Protection Service (*Služba zaštite)* and the Municipal Police (*Komunalna policija)*, use trucks, combined, special and work vehicles.

Fleet owned by the Capital City uses mostly diesel fuel, and a lower level of petrol. Total fuel consumption is presented in Table 4.1.

Table 4.1 Structure of fuel consumption of the Capital City fleet

Cars owned by the Capital City	Fuel consumption (l)	Consumption (TJ)
Unleaded petrol 95 (BMB)	146,136.58	5.17
Super petrol 98 (MB)	40,480.21	1.43
Diesel (D2)	353,635.61	12.36
Eco diesel	207,595.21	7.26
Gas (LPG)	5,125	0.13
Total	752,972.61	26.36

Almost half the total quantity of the fuel belongs to diesel D2, while the lowest percentage belongs to gas (Figure 4.2.).

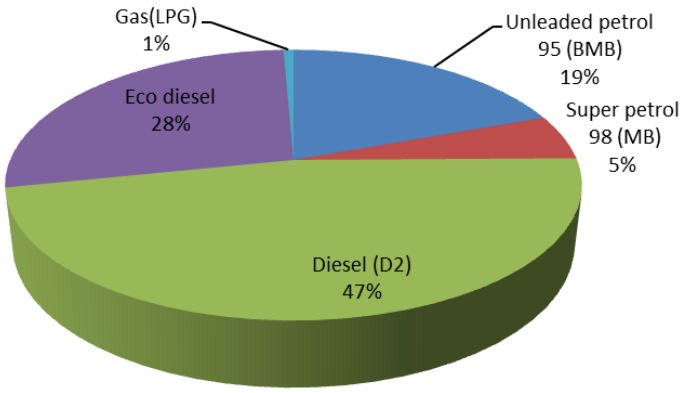

Figure 4.2 Share of specific fuel types in the total consumption of the fleet of the City of Podgorica

4.2. Public transport in the Capital City of Podgorica

Public transport in the Capital City of Podgorica includes bus transport, taxi and railway transport. This chapter presents detailed analysis of all three categories of public transport subsector.

4.2.1. Public bus transport

All buses use diesel as fuel, and the fleet characteristics are presented in Table 4.2.

Public transport in the territory of Podgorica in 2008 was provided by three transport companies, with the total of 27 lines (11 city lines and 16 suburban lines). However, certain lines are covered by several transport companies at the same time so that 116 buses cover 20 suburban lines and 14 city lines. Average age of the buses is 19 years (from 3 to 35 years). Overview of relevant data, per individual transport company, shows that the total number of passengers transported is 2,496,212, including city and suburban lines (Table 4.2).

Table 4.2 Characteristics of bus transport

PUBLIC BUS TRANSPORT OF PASSENGERS IN THE TERRITORY OF THE CAPITAL CITY OF PODGORICA				
Transport company	Number of vehicles	Number of passengers transported	Number of lines	
			City	Suburbs
Gradski saobraćaj PG d.o.o.	55	1,450,000	8	7
BLT d.o.o.	34	830,212	4	7

Montenegro prevoz Pejović d.o.o.	27	216,000	2	6
Total	116	2,496,212	14	20

Analysis of data on the city bus transport shows that the average drive on city lines compared to suburban lines is more than twice shorter, i.e. the city lines operate within a smaller geographic area (Figure 4.3).

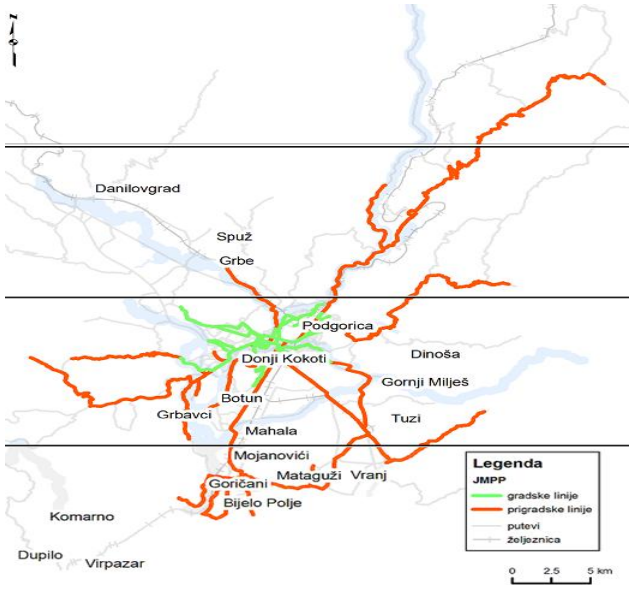

Figure 4.3 City and suburban bus lines network

According to the submitted data, the fuel type used in city transport is mostly diesel D2 (Figure 4.4) in the amount of 1,183,200 litres or 92%, while eco diesel consumption is 101,800 litres i.e. 8%. Total distance covered for all three transport companies was 3,022,410 km, with total consumption of 1,285,000 litres of fuel (Table 4.3).

Table 4.3 Fuel consumption and distance covered per individual transport company in 2008

FUEL CONSUMPTION IN BUS TRANSPORT IN THE TERRITORY OF THE CAPITAL CITY OF PODGORICA IN 2008				
Transport company	Fuel consumption in litres		Distance covered in km (per year)	Fuel consumption (TJ)
	Diesel D2	Ecodiesel		
Gradski saobraćaj PG d.o.o.	600,000		1,920,000	
BLT d.o.o.	432,000	85,000	886,410	
Montenegro prevoz Pejović	151,200	16,800	216,000	

d.o.o.				
Total	1,183,200	101,800	3,022,410	44.93

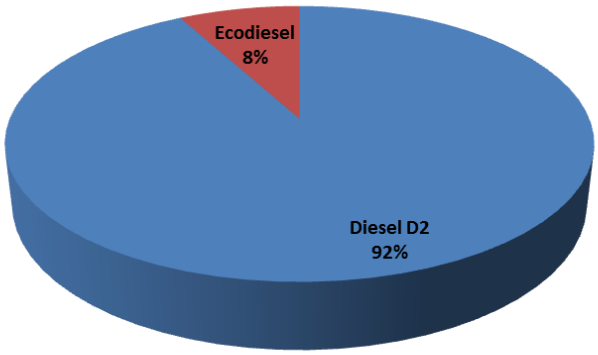

Figure 4.4 Share of specific fuel types in the total bus transport consumption

4.2.2. Taxi transport in the Capital City of Podgorica

There is also a taxi service operating within the public transport subsector of the Capital City. In the territory of the Capital City there were 17 registered taxi associations in 2008, with 420 vehicles. Total number of passengers transported by taxis was about 5,463,000, and the distance covered was 17,332,000 km.

Fuel consumption in taxi transport was about 1,548,500 litres, with high percentage of ecodiesel (97%), and diesel D2 to a significantly lower extent (Table 4.4., Figure 4.5).

Table 4.4 Fuel consumption in taxi transport in the Capital City of Podgorica in 2008

Energy type	Fuel consumption (l)	Fuel consumption (TJ)
Ecodiesel	150,204,500	52.52
Diesel D2	46,455	1.62
Total	1,548,500	54.14

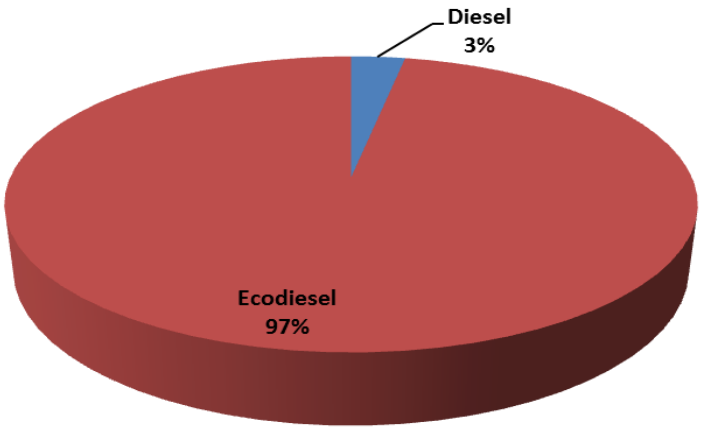

Figure 4.5 Share of specific types in the total fuel consumption for taxi transport

4.2.3. Railway transport

According to railway regulations, suburban transport includes train transport to 60 km distance, so that it includes the lines Bar – Podgorica and Kolašin – Podgorica (with total of 12 stops), and Nikšić – Podgorica and Podgorica – Božaj – Skadar (there was no passenger transport in 2008).

Railway distance in the line Podgorica – Bar is 49.7 km, and it covers the following stops for the local (suburban) trains, in the territory of the Capital City: Aerodrom, Golubovci, Morača, Zeta and Vranjina.

Within the line Podgorica – Kolašin, 64.5 km long, local trains have stops in the following places, in the territory of the Capital City: Zlatica, Bioče, Bratonožići, Lutovo, Kruševački potok, Trebješica.

Establishing of passenger train transport in the line Podgorica – Nikšić, after rehabilitation of this railway line, is planned for the end of 2011.

Regarding the characteristics of propulsion in passenger and cargo trains, as well as consumption per type of propulsion, the data are as follows:

- propulsion type for passenger vehicles is electric propulsion, with power 25 kV 50 Hz, with average consumption of 28 kWh/km;
- propulsion type for cargo trains is electric propulsion, with the same power and average consumption, and diesel propulsion, which uses diesel fuel D-2, with average consumption of 5.2 l/km.

Table 4.5. shows the annual energy consumption in railway transport in the Capital City of Podgorica.

Table 4.5 Annual energy consumption in railway transport in the Capital City of Podgorica

Year	Number of trains		Average consumption per month		Annual consumption (TJ)		Total annual consumption	Number of passengers transported	Number of distance covered in km
	Passenger	Cargo	Diesel D2 (t)	Electricity (in kWh)	Diesel D2	Electricity	TJ		
2008	7,558	5,752	52	1,100,000	26.208	47.52	73.728	532, 862	30,905,996

4.2.4. Total fuel consumption in the public transport subsector

The public transport subsector includes city and suburban bus lines and city railway transport. Total energy consumption (TJ) per category of the subsectors in 2008 is presented in Table 4.6 and Figure 4.6.

Table 4.6 Structure of fuel consumption in public transport subsector in the Capital City of Podgorica in 2008

Category	Energy consumption, TJ
Bus transport	44.93
Taxi transport	54.14
Railway transport	73.73
TOTAL	**172.80**

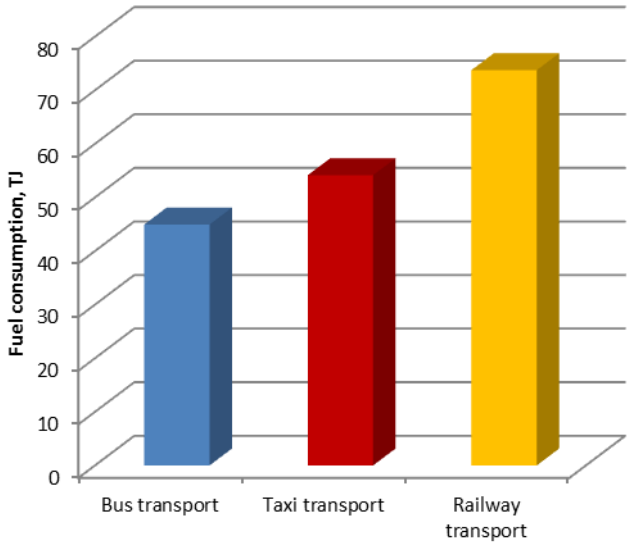

Figure 4.6 Structure of fuel consumption in the public transport subsector in the Capital City of Podgorica

Out of the total fuel consumption in the public transport subsector, 43% is consumed in railway transport, 31% in taxi transport and 26% in bus transport.

4.3. Private and commercial vehicles

4.3.1. General information

According to the official data of the Ministry of Interior and Public Administration, and based on the data on the technical inspections conducted, the number of registered motor vehicles and trailers in the territory of the Capital City in 2008 was 69,114 (Figure 4.7). By comparing the statistical data and having in mind assessments of analysts, it can be stated that the number and daily use of cars increases from year to year, resulting in traffic congestion in the city, higher level of environment pollution, parking problems etc.

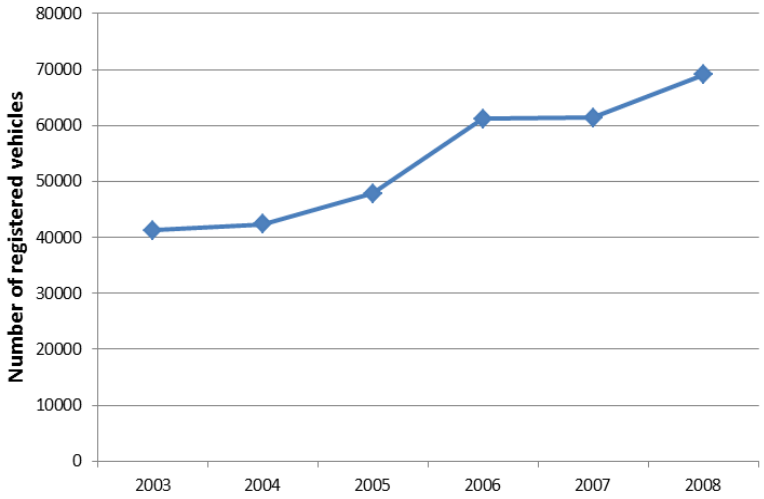

Figure 4.7 Number of registered vehicles in the Capital City of Podgorica in the period from 2003 to 2008

When considering the ownership structure of vehicles, it can be stated that the number of vehicles owned by physical persons is significantly higher compared to vehicles owned by legal persons (Figure 4.8). It is characteristic that there was a reduction in the number of vehicles owned by physical persons in 2007, and the number of vehicles owned by legal persons grew continuously in the concerned period.

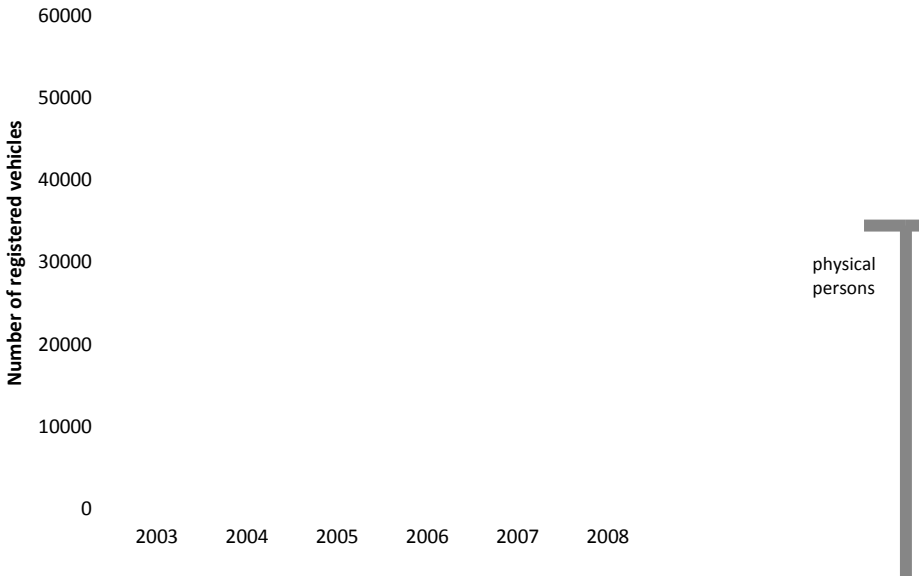

Figure 4.8 Number of registered vehicles according to ownership for the period 2003-2008

Out of the total number of registered vehicles in 2008 (69,114 vehicles), 55,706 vehicles were owned by physical persons, i.e. about 81%, and 12,924 vehicles were owned by legal persons.

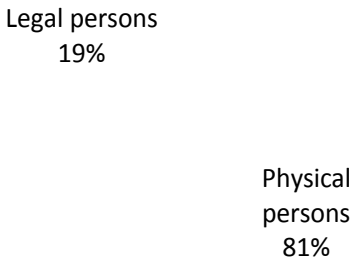

Figure 4.9 Structure of registered vehicles according to the ownership in 2008

Structure of vehicles according to the type (Table 4.7) is characterized by diversity that includes passenger cars, motorcycles and various commercial vehicles (buses, trucks, trailers etc.). The largest number belongs to passenger cars and trucks.

Table 4.7 Number of motor vehicles and trailers per type of vehicle in 2008

Number of registered motor vehicles and trailers								
Motorcycles	Passenger cars	Vans	Buses	Trucks	Special and work vehicles	Tractive units	Trailers	Agricultural tractors
1 146	61 558	160	255	4 815	427	238	500	5

In the total number of vehicles in the subsector of private and commercial vehicles of the Capital City of Podgorica, the largest share belongs to cars that cover 89% of the total number of vehicles. Out of the rest of the vehicles in the subsector a significant group covers trucks with about 7%. Structure of registered vehicles in 2008 per type of vehicle is presented in Figure 4.10.

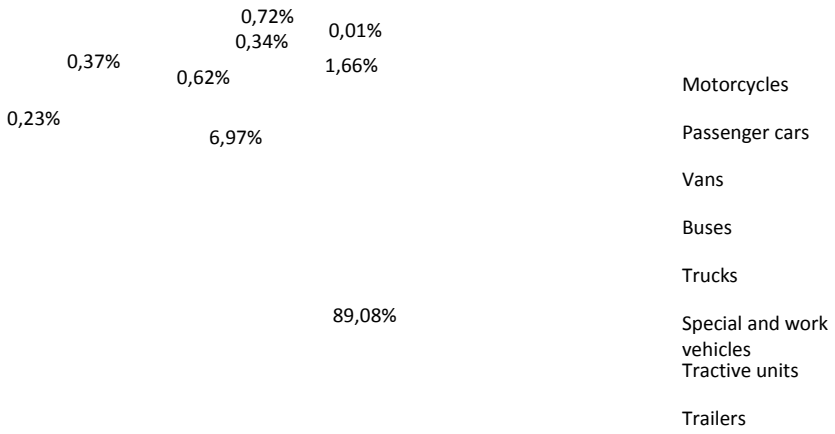

Figure 4.10 Structure of registered vehicles per vehicle type in the Capital City of Podgorica in 2008

Overview of age structure for the period from 1979 to 2008 is presented in Figure 4.11. Most vehicles (72%) are over 10 years old, and there are 28% vehicles of new generation.

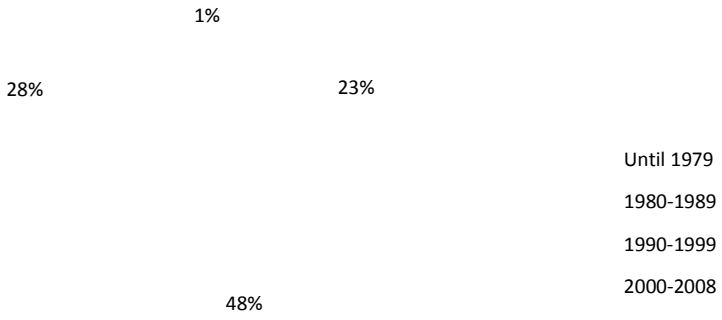

Figure 4.11 Age structure of vehicles registered in the Capital City of Podgorica

4.3.2. Fuel consumption for various types of vehicles

Data on the structure and total fuel consumption of private and commercial vehicles were not available, because there is no record kept or it is practically impossible to keep the records. Another justification is the fact that Podgorica is a transit center with high transport dynamics, so that even data on the quantity of fuel sold in petrol stations cannot be a sufficiently relevant indicator.

Having in mind the above stated, an estimate of fuel consumption for the stated vehicle categories was done for the purpose of this Action Plan. The calculation was based on the data on the share of individual vehicle types and their age. Consumption projections also refer to average consumption of passenger vehicles compared to consumption of commercial vehicles.

Estimate of fuel consumption for private and commercial vehicles in the territory of Podgorica is presented in Table 4.8 and Figure 4.12.

Table 4.8 Structure of fuel consumption per fuel type in the private and commercial vehicles sector at the City level

Vehicle type	Fuel type (l)					Consumption (TJ)
	Ecodiesel	Unleaded petrol BMB	Super petrol MB	Gas (LPG)	Diesel D2	
Motorcycles		401,040				14.20
Passenger cars	17,629,056	17,629,056	2,938,176	8,814,528	11,752,704	1,974.58
Vans	307,200				460,800	26.85
Buses	2,542,306.5				282,478.5	98.77
Trucks	33,579,000				14,391,000	1,677.27
Special vehicles	850,000				850,000	59.44
Tractive units					624,000	21.82
Tractors					3,000	0.10
Total	54,907,562.5	18,030,096	2,938,176	8,814,528	27,739,983	3,873.04

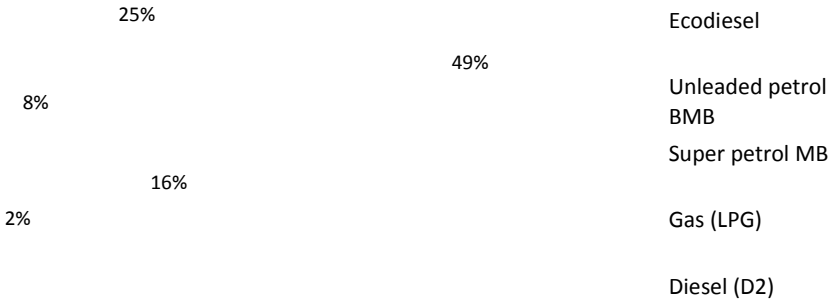

Figure 4.12 Share of specific fuel types in the total consumption in the private and commercial vehicles sector at the City level

In the sector of private and commercial vehicles**,** ecodiesel has the highest share in the total fuel consumption of this subsector amounting to 49%. Share of diesel D2 fuel consumption is 25%, unleaded petrol BMB and super petrol MB is 18%, and gas 8% of the total consumption.

Consumption share for individual vehicle category, in TJ, is presented in Picture 4.13.

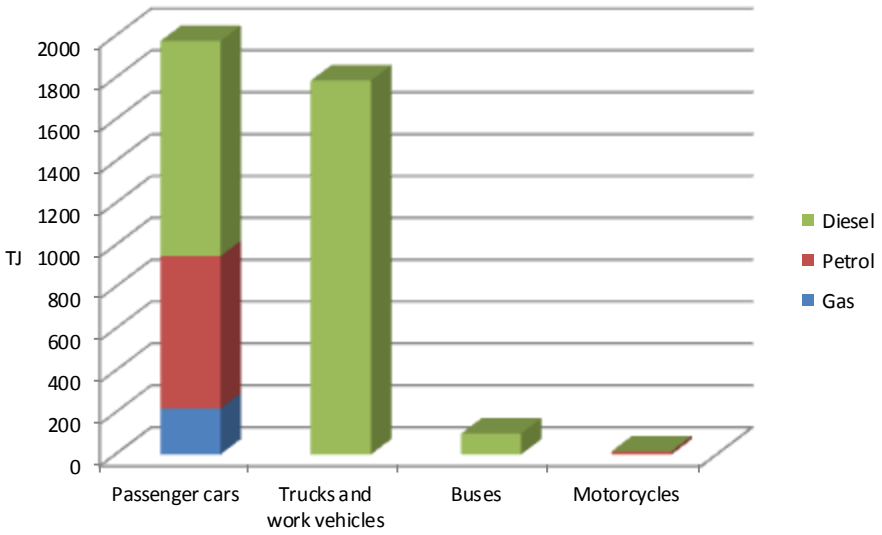

Figure 4.13 Share of fuel consumption in the private and commercial vehicles subsector in the territory of the Capital City of Podgorica

In the total fuel consumption of the private and commercial vehicles subsector, private vehicles have a share of 54%, trucks and work vehicles 48%, and about 2.7% belongs to buses and 0.3% to motorcycles owned by physical and legal persons.

4.4. Conclusion

The analysis conducted regarding fuel consumption in the transport sector of the Capital City of Podgorica in 2008 shows far higher share in consumption of the private and commercial vehicles subsector (Figure 4.14).

To that view, the measures proposed for reduction of greenhouse gas emission from the transport sector relate to reaching of the target set for the increase in the share of public transport, but also education and promotion of alternative forms of transport.

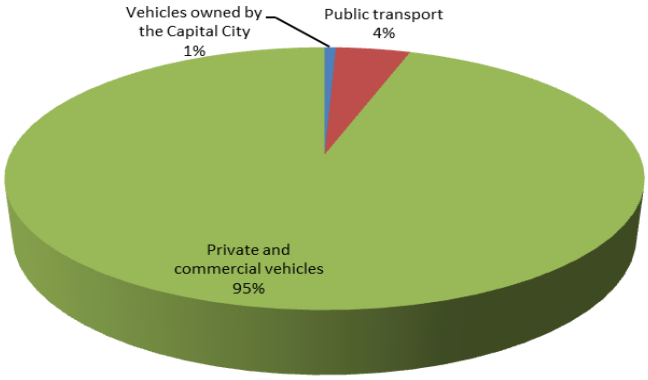

Figure 4.14 Structure of fuel consumption per subsectors in the transport sector in the Capital City of Podgorica

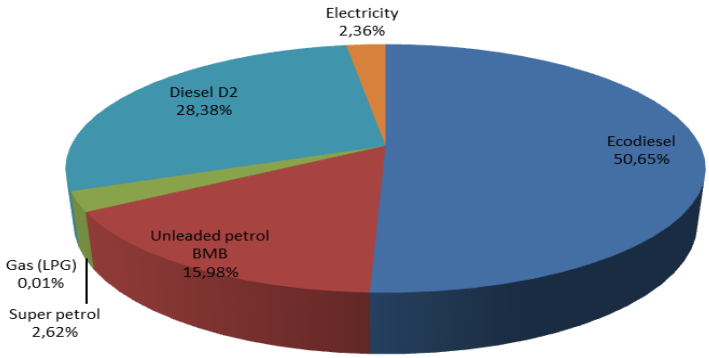

Figure 4.15 Structure of various fuel types consumption in the transport sector in the Capital City of Podgorica

Total energy consumption in the transport sector of the Capital City of Podgorica in 2008 was 4,026.17 TJ, out of which 95% belong to the private and commercial vehicles subsector, 4% to the public transport subsector, and 1% to vehicles owned by the Capital City. Share of diesel in the total fuel consumption was about 80%, about 19% of petrol, and about 2.5% of electricity and gas (Figure 4.15).

5. Analysis of energy consumption in the public lighting sector of the Capital City of Podgorica in 2008

5.1. Introduction

The entire Capital City public lighting network is owned by the Capital City itself, which simplified and accelerated the process of collecting the required data, and which will certainly facilitate implementation of the identified energy efficiency measures.

Relevant data for the analysis of electricity consumption in the public lighting sector of the Capital City were collected by:

- City administration;
- PI Municipal Services (JP *Komunalne usluge)*.

Having in mind the monitoring activities implemented in this sector, the reliability of the data collected is at a high level.

In order to have adequate analysis of consumption per energy type in the public lighting sector of the Capital City of Podgorica, appropriate data were collected relating to:

- general parameters and characteristics in the public lighting sector;
- structure of the public lighting electrical network of the Capital City;
- types of electrical light sources (light bulbs);
- categories of electrical lighting fittings (lamps);
- total electricity consumption of the sector (kWh).

5.2. General information on the public lighting sector of the Capital City of Podgorica

JP *Komunalne usluge* (PI Municipal Services) is in charge of maintenance of public lighting facilities and traffic lights in the territory of the Capital City. In 2008, public lighting and traffic lights included 5,044 lamps and 10,083 light bulbs. Total length of underground and overhead lines was 250,500 m.

The number of metering points supplying the public lighting facilities is constantly increasing, and this number was 352 at the end of 2008.

Out of the total number of lamps (10,083), 7,888 of them were lamps with sodium bulbs, and 1,996 with mercury bulbs, while other lighting sources cover 199 lamps.

Technical documentation for public lighting in the Capital City currently exists only in paper form, i.e. there is no lighting register within the geographic information system (GIS).

Geographic Information System (abbr. GIS) is a very important tool in the process of adequate and efficient management, because it allows displaying of every facility of interest, and in the case of public lighting those are: lighting fittings, power lines and measuring points, in the form of corresponding symbols in their actual position in space. GIS integrates spatial information with other types of information within a system and in that way it offers a consistent framework for spatial analysis. Namely, apart from geo-information, every facility in the space is associated with a provisional (but defined in advance) set of additional information (attributes) describing the facility in full and forming a basis for various analyses during the use of the system.

Public lighting GIS provides faster access to data (stand-by service, development, maintenance), easier orientation, efficient management (all lighting point and power line parameters are available in advance), rational resources management, easier data sharing with other municipal services and efficient analysis of the current status and needs (monitoring interventions, costs, changes etc.).

5.3. Public lighting electrical network of the Capital City of Podgorica

5.3.1. Structure of the public lighting electrical network of the Capital City of Podgorica

Public lighting facilities of the Capital City of Podgorica include power devices, cables (underground or overhead), poles, lamp posts, lamps, lighting sources and management and regulation devices. Public lighting facilities are supplied from the distribution network through 10/0.4 kV transformer stations. Metering points are located in separate closets or as a public lighting box within the low voltage block in the transformer station. Entire topology of public lighting network depends on the distribution and the size of city areas and the distribution of transformer stations or distribution boards providing their supply.
Public lighting management is carried out through astronomical internal clocks for management depending on the sunrise and sunset. Public lighting in Podgorica operates for 4,360 hours on average.

In certain parts of the city, there is a very low percentage of the so called whole-night or half-night public lighting management systems with the option to reduce lighting intensity late at night (after 23 p.m.).

The largest number of lamps in 2008 (in the urban area) include new generation lamps (up to 15 years old) that require installation of sodium lighting sources from 70 to 400W, efficient optics and IP protection, while rural and suburban areas have older generation lamps that are usually 25-30 years old and primarily intended for

installation of mercury bulbs. In the territory of the Capital City (urban area), most frequent bulbs used are the ones with 250W and 150W with electromagnetic ballasts without regulating option, and the ones used in rural and suburban areas are mercury bulbs with 250W and 160W.

The structure of the public lighting in the Capital City of Podgorica per type of light source is presented in Table 5.1. and Figure 5.1.

Table 5.1 Characteristics of public lighting in the Capital City of Podgorica

Bulb type	NaV	Mercury	Metal-halogen	Other	Total
Total bulbs	7888	1996	123	76	10083

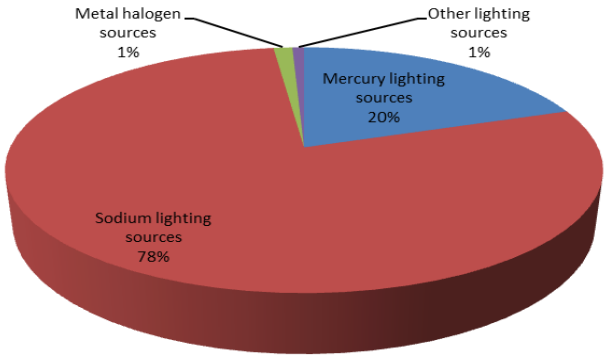

Figure 5.1. Structure of public lighting per type of light source

The dominating lighting source in the structure of public lighting in the Capital City of Podgorica is sodium bulb. Also, about 20% include mercury lighting sources. Metal halogen bulbs and other lighting sources cover a low percentage, mostly in suburban areas.

Recent construction of new public lighting facilities as well as reconstruction of the existing ones mostly included use of the most modern lights with better mechanical, thermal and electrical protection with the lighting source regulating option. Optical block construction (higher curve level) as well as the mirror manufacturing technology allow better use level of lights resulting in light with lower power, better lighting technical parameters as well as reduction of light pollution.

5.3.2. Electricity consumption in the public lighting sector in the Capital City of Podgorica

Supply of the electrical public lighting system in the Capital City in 2008 required 11,352,927 kWh electricity.
Electricity consumption for public lighting in the territory of the Capital City in 2003 amounted to 7,211,256 kWh, and the amount in 2008 was 11,352,927 kWh which is 36.5% increase in a five-year period.

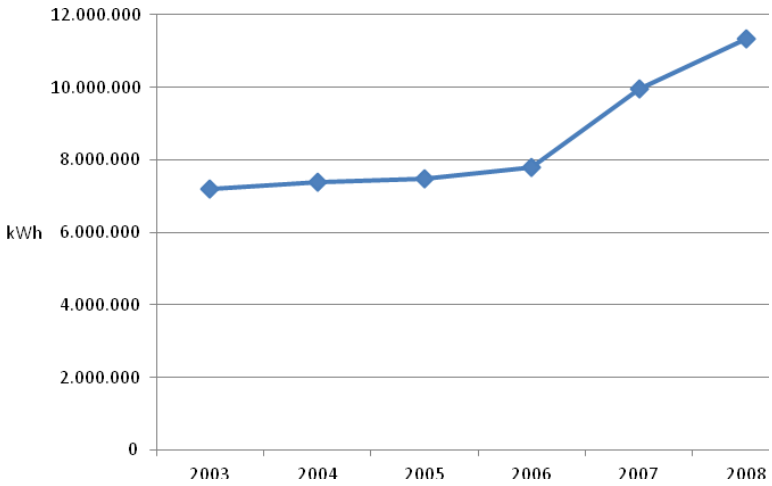

Figure 5.2. Electricity consumption for public lighting in the Capital City of Podgorica for the five-year period from 2003 to 2008

5.4. Conclusion

Apart from its basic function, public lighting must meet a number of other requirements such as esthetic fitting into the visual identity of the area, creation of nice ambience, cost-efficiency, reliability, reduction of maintenance costs, remote management option and similar. With the aim to create conditions to meet all of the stated requirements, and in accordance with the applicable procedures, the *Recommendations for Designing, Construction and Maintenance of Public Lighting in the territory of the Capital City of Podgorica* were adopted at the end of 2008.

The main principles that comprise the basis for adoption of the *Recommendations* are as follows:

- application of modern technical and technological solutions;
- reduction of costs for the electricity consumed;
- reduction of costs for public lighting facilities maintenance;
- creating possibilities for remote management and supervision over public lighting facilities;
- increasing security of citizens through application of efficient protection from faults on installations.

In the following period, according to the principles that form the basis for the adopted *Recommendations for Designing, Construction and Maintenance of Public Lighting* and traffic lights in the territory of the Capital City, the focus in the work will be on realization of the measures that include rationalization of electricity consumption and modernization of the existing meters for public lighting and traffic lights.

To that view, it is necessary to replace all technologically outdated mercury lights with new generation lights that include installation of devices for reduction of installed

power of electronic ballast with regulation option. This allows savings of about 40%, and improved lighting performances, longer life, and minimum maintenance costs. Also, in order to determine the most favourable and efficient system for electricity savings of minimum 30% at the Capital City level, the plan for the future period includes installation of various electricity saving systems as pilot projects by a number of renowned manufacturers.

Furthermore, it is planned to develop a viability and economic feasibility study for lease of energy saving systems in metering points that do not have such systems. Equipment would be leased for a period of 10 – 15 years. Payment for the depreciation of the leased equipment will be made from the financial savings.

Opting for modern planning and maintenance of public lighting facilities and traffic lights requires elaboration of survey maps as basis for development of GIS data base for all public lighting and traffic lights facilities. The plan also includes elaboration of lighting technical map for the territory of the Capital City which will regulate in detail lighting classes for the streets and provide for technical parameters necessary for public lighting designing.

Also, one of the activities and plans in the following period is considering the possibility to realize savings in electricity consumption by installing LED lights and solar lights through pilot projects. It is estimated that installation of LED lights would result in 6 times lower electricity consumption.

The planned and implemented energy efficiency measures in the public lighting sector in the Capital City of Podgorica show proactive policy of the city administration for sustainable, energy-friendly development of the sector through use of modern, environment-friendly solutions resulting both in significant energy savings and reduction in light pollution.

Identified measures for CO_2 emission reduction in the public lighting sector of the Capital City are presented in chapters 7 and 8.

6. Baseline Emission Inventory for the Capital City of Podgorica

6.1. Introduction

CO_2 Baseline Emission Inventory of the Capital City of Podgorica (hereinafter: the Inventory) was elaborated for 2008 which was selected as the baseline year. The main criteria in selection of the baseline year was the availability of data required for calculation of CO_2 emission. Unreliable energy consumption data and the necessary estimate of CO_2 emission would result in significant insecurity of the baseline emission inventory which is not in accordance with the principles of the methodology prescribed by the European Commission.

The Inventory included three sectors of final energy consumption in the Capital City: buildings, transport and public lighting, in accordance with the sector classification in

the recommendations of the European Commission. The calculation covered direct (fuel burning) and indirect emission (electricity and thermal energy consumption).

CO_2 baseline emission inventory of the Capital City of Podgorica was done in accordance with the Protocol of the Intergovernmental Panel on Climate Change – IPCC as the executive body of the UN Environment Programme - UNEP and the World Meteorological Organization – WMO in implementation of the United Nations Framework Convention on Climate Change – UNFCCC. By ratifying the Kyoto Protocol in 2007, Montenegro committed to monitoring and reporting on the pollutant emission to the atmosphere according to the IPCC Protocol, and it was also used as the nationally recognized protocol in elaboration of CO_2 baseline emission inventory for the Capital City of Podgorica. Since IPCC has not suggested the methodology for calculation of indirect emission, the methodology for calculation of emission from generation of heating energy was developed within this Inventory, and the average emission factor for the EU member countries was used for indirect electricity emission (Table 6.1.).

Table 6.1 Emission factors used for determining CO_2 emission in the buildings sector of the Capital City of Podgorica

ENERGY TYPE	Emission factors	
	Unit	CO_2
Electricity	g CO_2/kWh$_{el}$	476
Natural gas	t/TJ	56.99
Heating oil	t/TJ	78.23
Liquified petroleum gas	t/TJ	63.89
Fuel oil	t/TJ	78.23
Lignite (brown coal)	t/TJ	101.20
Petrol	t/TJ	70.08
Diesel	t/TJ	73.91
Wood	t/TJ	0.0

6.2. CO_2 Baseline Emission Inventory in the buildings sector

CO_2 emission from the buildings sector of the Capital City of Podgorica includes emission from the electricity consumption as well as fuel burning. Emission from fuel burning is calculated through standard emission factors (the first level of IPCC methodology calculation), and the average emission factor for the EU member countries was used for calculation of the emission from the electricity consumption.

Table 6.2 shows the consumption and CO_2 emission per subsector and category of the buildings sector.

Table 6.2 CO_2 emission in the buildings sector of the Capital City of Podgorica

CATEGORY	Heating oil	Natural gas	Wood	Electricity	Total tCO_2
City administration			0	921	921
Local community			0	95	95
Cultural institutions	30	2	0	264	296
Apartments and office premises owned by the City			0	1,642	1,642
Enterprises owned by the City			0	1,143	1,143
Companies owned by the City			0	796	796
Other			0	130	130
BUILDINGS OWNED BY THE CITY	30	2	0	4,991	5,023
APARTMENTS - HOUSEHOLDS			0	203,066	203,066
COMMERCIAL AND SERVICE ACTIVITIES			0	59,028	59,028
BUILDINGS TOTAL	30	2	0	267,086	267,117

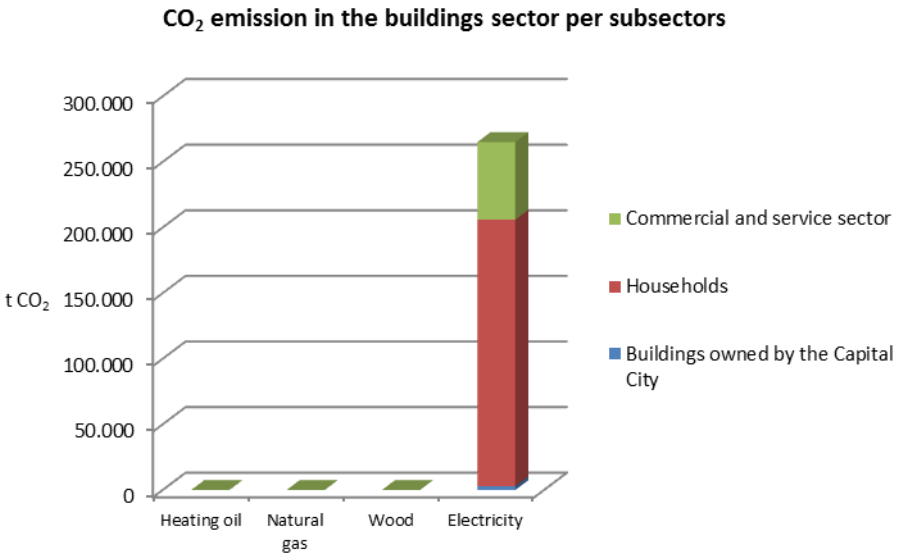

Figure 6.1 CO_2 emissions in the buildings sector of the Capital City of Podgorica

Figure 6.2 shows distribution of CO_2 emission in the buildings sector per subsectors, and Figure 6.3 shows distribution of CO_2 emission according per energy type.

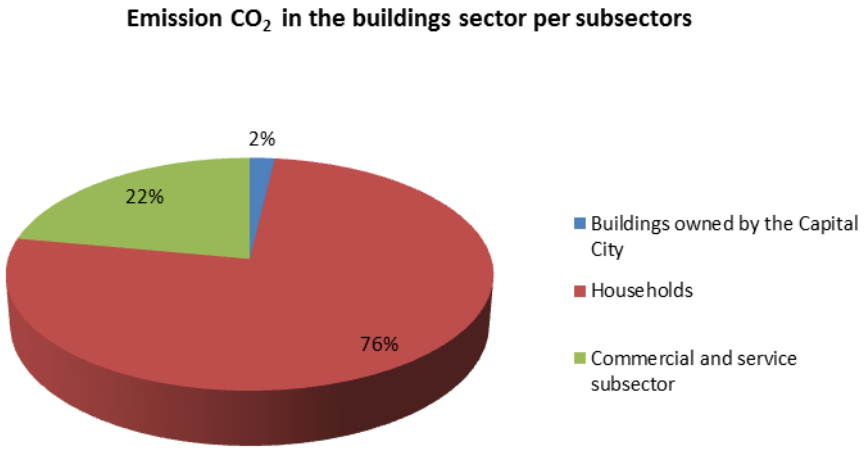

Figure 6.2 Distribution of CO_2 emission in the buildings sector of the Capital City of Podgorica per subsector

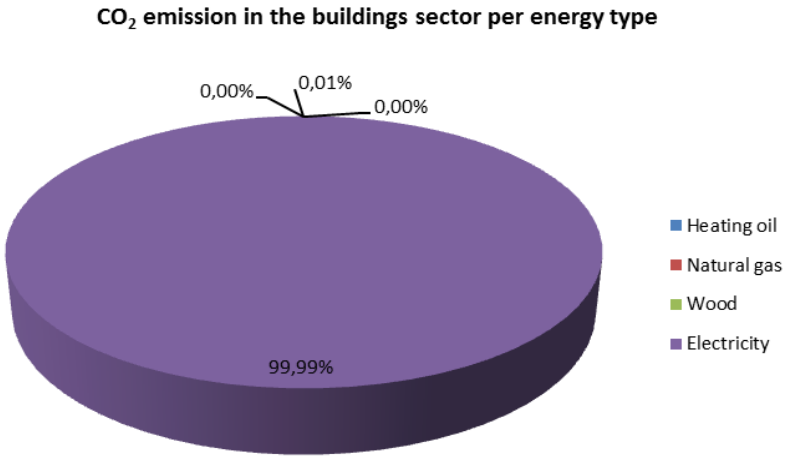

Figure 6.3 Distribution of CO_2 emission in the buildings sector of the Capital City of Podgorica per energy type

Among the subsectors in the buildings sector, the highest share in the total emission belongs to apartments (76%), followed by commercial and service buildings (22%), and buildings owned by the Capital City (2%) (Figure 6.2).

The highest share in the total CO_2 emission belongs to indirect emission from electricity consumption with the share of 99.99%, and the emission from heating oil

and natural gas is not significant, i.e. it is less than 0.01% of the total emission (Figure 6.3).

6.3. CO_2 Baseline Emission Inventory in the transport sector

6.3.1. Methodology for elaboration of the CO_2 Baseline Emission Inventory in the transport sector of the Capital City of Podgorica

In urban areas, the transport sector and in particular road transport, may be stated as the most significant air pollution factor, which contributes to a large extent to creation of greenhouse gases - CO_2, CH_4 and N_2O. CO_2 emission from motor vehicles depends on many parameters among which the most significant are: fuel quality, engine and vehicle construction performance, driving regime, external meteorological conditions, engine maintenance and its age etc.

CO_2 baseline emission inventory for the transport sector of the Capital City of Podgorica is divided into three basic subsectors:

- CO_2 emission from vehicles owned by the Capital City;
- CO_2 emission from public transport;
- CO_2 emission from private and commercial vehicles.

For calculation of emission from fuel burning and evaporation from the transport sector we used COPERT III computer programme, developed by the EEA (European Environmental Agency) within the EMEP/CORINAIR methodology.

6.3.2. CO_2 emission from vehicles owned by the Capital City of Podgorica

The subsector of vehicles owned by the City includes a fleet of 340 motor vehicles.

Table 6.3 shows CO_2 emission from the fleet owned by the Capital City of Podgorica in 2008 per fuel used.

Table 6.3 CO_2 from the fleet owned by the Capital City of Podgorica

Vehicles owned by the Capital City	Quantity of fuel consumed		Emission
	l	TJ	t CO_2
Motor gasoline	186,616.79	6.61	462.96
Diesel	561,230.80	19.62	1,450.34
LPG	5,125.00	0.13	8.14
TOTAL	752,972.61	26.36	1,921.44

6.3.3. CO_2 from the public transport of the Capital City of Podgorica

Public transport subsector of the Capital City of Podgorica covers public bus and railway transport and taxi transport in the city territory. Bus transport of the Capital City of Podgorica in 2008 was provided with the fleet which included 116 buses using diesel fuel. Railway transport included 13,310 passenger and truck vehicles using diesel and electricity, and the taxi fleet included 420 vehicles using diesel fuel.

Fuel consumption and CO_2 emission in the public transport subsector are presented in Table 6.4.

Table 6.4 Fuel consumption and CO_2 emission in the public transport subsector

Category	Quantity of fuel consumed	Emission
	TJ	t CO_2
BUS TRANSPORT	44.93	3,320.71
TAXI TRANSPORT	54.14	4,001.64
RAILWAY TRANSPORT	73.73	8,220.20
TOTAL	**172.80**	**15,542.55**

CO_2 emission from the public transport of the City is 15542.55 t CO_2.

6.3.4. CO_2 emission from private and commercial vehicles

The private and commercial vehicles subsector comprises the categories of private vehicles and trucks, and the combined vehicles are a part of the private vehicles category.

Total consumption per individual fuel type and CO_2 emission in the private and commercial vehicles subsector in 2008 are presented in Table 6.5.

Table 6.5 Total fuel consumption and associated CO_2 emission from the private and commercial vehicles subsector

Subsector	Fuel consumption, TJ	Emission t CO_2
Private vehicles	1,974.58	140,950.88
Trucks and work vehicles	1,785.49	131,962.53
Mopeds and motorcycles	14.20	994.91
Buses	98.77	7,299.83
TOTAL	**3,873.04**	**281,208.15**

6.3.5. Total CO_2 emission in the transport sector of the Capital City of Podgorica

Comparison of energy consumption per transport subsectors in the Capital City of Podgorica is presented in Table 6.6., and the associated CO_2 emission in the transport sector is presented in Table 6.7.

Table 6.6 Energy consumption in the transport sector of the Capital City of Podgorica

Fuel consumption, TJ	Petrol	Diesel	LPG	Electricity	TOTAL
Vehicles owned by the City	6.61	19.62	0.13		26.36
Public transport		125.28		47.52	172.80
Private and commercial vehicles	742.33	2,911.59	219.12		3,873.04
Total	**748.93**	**3,056.49**	**219.25**	**47.52**	**4,072.19**

Table **6.7** Total CO_2 emission in the transport sector of the Capital City of Podgorica

Subsector	Emission t CO_2				
	Petrol	Diesel	LPG	Electricity	Total
Vehicles owned by the City	462.96	1,450.34	8.14		1,921.44
Public transport		9,259.34		6,283.21	15,542.55
Private and commercial vehicles	52,018.54	215,190.90	13,998.70		281,208.15
TOTAL	**52,481.50**	**225,900.58**	**14,006.84**	**6,283.21**	**298,672.13**

Graphic overview of fuel consumption and the associated CO_2 emission is presented in Figures 6.4. and 6.5.

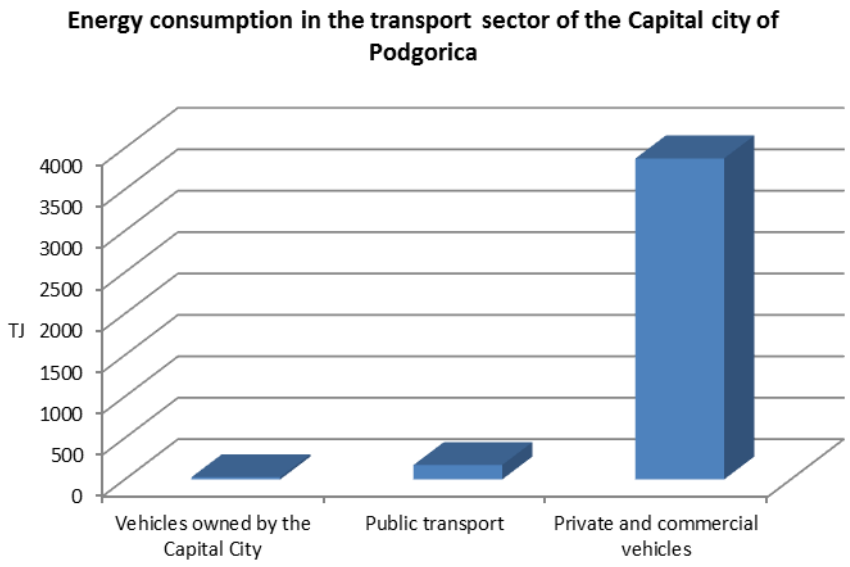

Figure 6.4 Comparison of fuel consumption in the subsectors within the transport sector of the Capital City of Podgorica

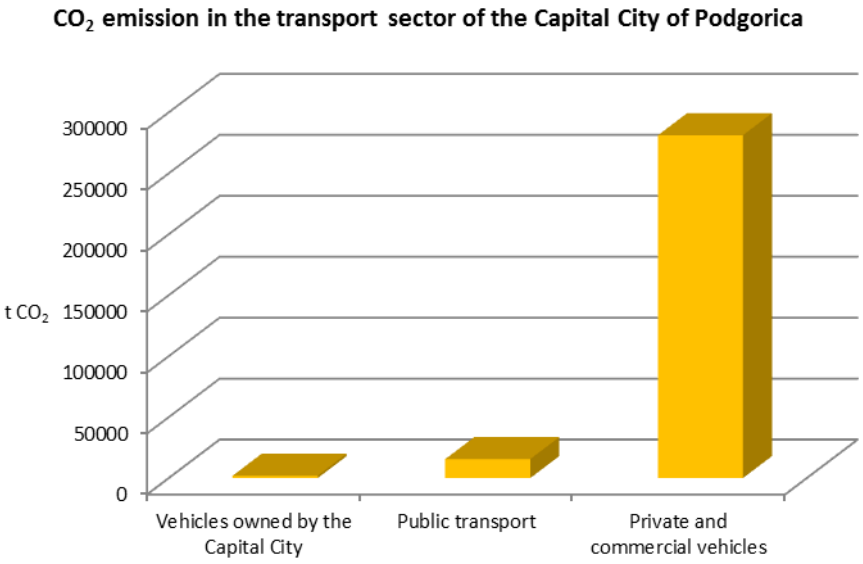

Figure 6.5 Distribution of CO_2 emission in the transport sector of the Capital City of Podgorica per subsector

Figure 6.6 presents distribution of CO_2 emission from the transport sector per energy type.

Error! Not a valid link.**Figure 6.6** Distribution of CO_2 emission in the transport sector per energy type

Total CO_2 emission in the transport sector of the Capital City of Podgorica in 2008 was 298,672.13 t. The highest share in the emission belongs to the private and commercial vehicles subsector (94%), followed by public transport (5%), and the rest belongs to vehicles owned by the City (1%) (Figure 6.5.).

CO_2 emission from diesel has a share of 76% in the total emission from the transport sector, followed by motor gasoline with the share of 17% in the total emission. The rest of the emission share belongs to LPG (5%) and electricity (2%).

6.4. CO_2 baseline emission inventory from the public lighting sector of the Capital City of Podgorica

CO_2 emission from the public lighting sector of the Capital City of Podgorica includes indirect CO_2 emission from electricity consumption of the public lighting system.

Table 6.8. shows electricity consumption and the associated CO_2 emission for the public lighting electrical network.

Table 6.8 Electricity consumption and indirect CO_2 emission from the public lighting electrical network

	Electricity consumption	Emission factor	Emission
	MWh	t CO_2/MWh	t CO_2
Public lighting - electricity	11,352.93	0.476	5 404

Total emission in the public lighting sector is 5,404 t CO_2.

6.5. Total CO_2 baseline emission inventory of the Capital City of Podgorica

6.5.1. Energy consumption of the Capital City of Podgorica

CO_2 baseline emission inventory of the Capital City of Podgorica for 2008 includes CO_2 emission from the sectors of buildings, transport and public lighting based on energy consumption of individual sectors (Table 6.9 and Figure 6.7).

Table 6.9 Distribution of energy consumption in individual sector per energy type

Energy type	Fuel consumption TJ	%

	Transport	Public lighting	Buildings	Total per energy type	Share per energy type
Diesel	3,056.49			3,056.49	48.31%
Motor gasoline	748.93			748.93	11.84%
LPG	219.25			219.25	3.47%
Electricity	47.52	40.87	2,019.97	2,108.36	33.33%
Heating oil			0.38	0.38	0.01%
Natural gas			0.04	0.04	0.00%
Wood			192.92	192.92	3.05%
TOTAL	**4,072.19**	**40.87**	**2,213.31**	**6,326.38**	**100.00%**
Individual sector share	**64.37%**	**0.65%**	**34.99%**	**100.00%**	***/***

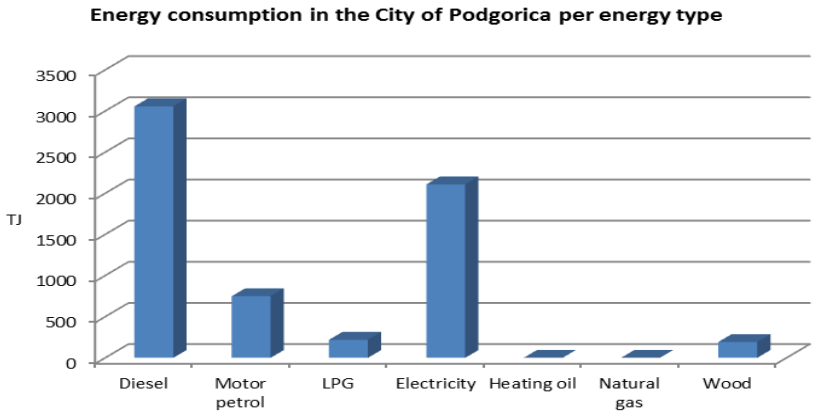

Figure 6.7 Structure of energy consumption per energy type in 2008

Figure 6.7 shows that diesel is the energy type with the highest share in the total energy consumption (48%). Electricity consumption in 2008 was 2,108.36 TJ, which is 33.33% of the total energy consumption. The energy types which have higher share, apart from diesel and electricity, are also motor gasoline with consumption of 748.93 TJ (11%), LPG with consumption of 219.25 TJ (3%), and wood with consumption of 192.92 TJ (3%). The remaining low share in the consumption belongs to heating oil and natural gas.

Total energy consumption in the concerned sectors of the Capital City of Podgorica is 6,326.38 TJ, out of which 4,072.19 TJ is spent in transport, followed by the buildings sector with consumption of 2,213.31 TJ, and public lighting with 40.87 TJ (Figure 6.8.).

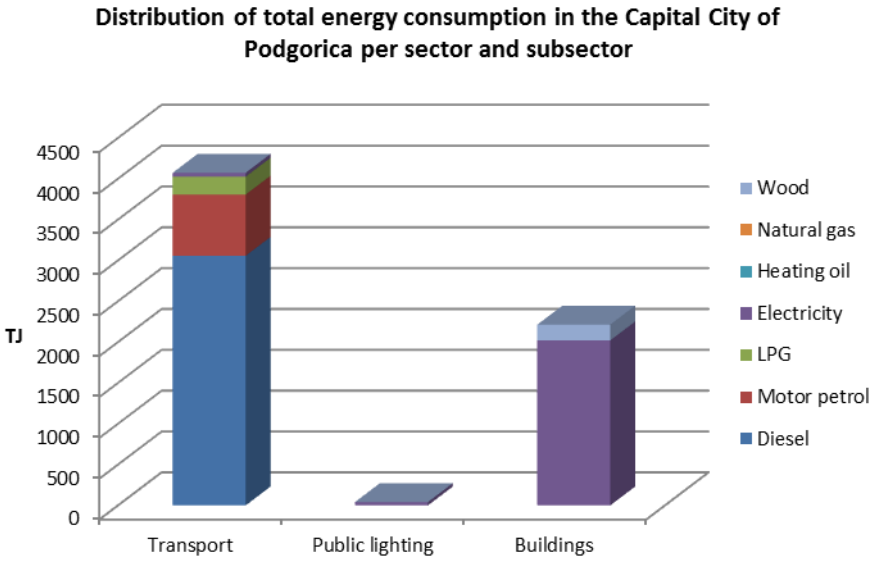

Figure 6.8 Structure of energy consumption in the Capital City of Podgorica per sector and energy type in 2008

Figure 6.8. shows distribution of the total energy consumption in the Capital City of Podgorica per sector and energy type.

The highest share of 64.37% in the total energy consumption belongs to the transport sector, followed by the buildings sector with 34.99%, and public lighting with 0.65%.

6.5.2. Total CO_2 emission of the Capital City of Podgorica

CO_2 baseline emission inventory of the Capital City of Podgorica covers direct CO_2 emissions occurring due to fuel burning and indirect CO_2 emission from electricity and thermal energy consumption from the sectors of buildings, transport and public lighting.

Table 6.10 shows CO_2 emissions per sector and energy type.

Table 6.10 CO_2 emissions per sector and energy type

Energy type	Emission, tCO_2				%
	Transport	Public lighting	Buildings	Total per energy type	Share per energy type
Diesel	225,900.58			225,900.58	**39.54%**
Motor gasoline	52,481.50			52,481.50	**9.19%**
LPG	14,006.84			14,006.84	**2.45%**
Electricity	6,283.20	5,403.997575	267,085.57	278,772.78	**48.81%**

Heating oil			29.55	29.56	**0.01%**
Natural gas			2.25	2.26	**0.00%**
Wood			0.00		**0.00%**
TOTAL	298,672.13	5,404.00	267,117.38	571,193.51	**100.00%**
Individual sector share, %	**52.29%**	**0.95%**	**46.76%**	**100.00%**	**/**

Figure 6.9. shows the total CO_2 emission per energy type, and Figure 6.10 shows the structure of emissions per sector and energy type. Figure 6.11 shows and overview of the CO_2 emission structure per sector.

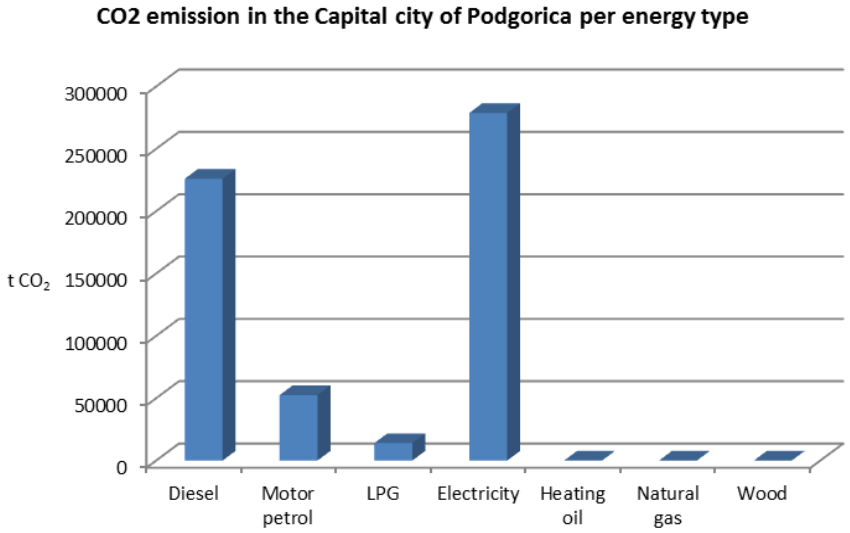

Figure 6.9 Structure of CO_2 emission per energy type in the Capital City of Podgorica in 2008

Figure 6.9 shows that electricity is the energy type with the highest share in the total CO_2 emission in the Capital City of Podgorica. Emission from electricity consumption in 2008 was 278,772.78 t CO_2, which is 48.81% of the total CO_2 emission. The following is diesel with 225,900.58 t CO_2 emission, (39.54%), motor gasoline with 52,481.50 t CO_2 (9.19%), LPG with 14,006.84 t CO_2 (2.45%). The remaining share belongs to heating oil and natural gas with emission lower than 1%.

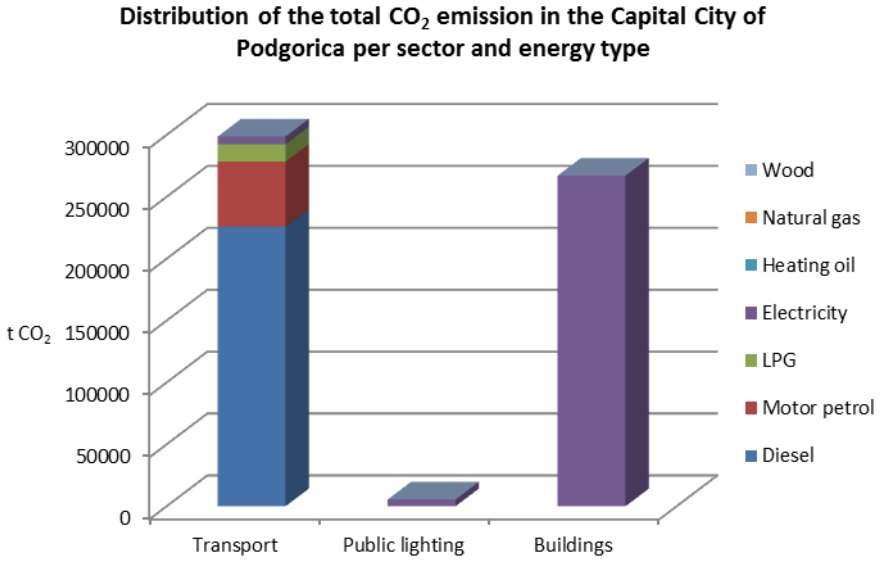

Figure 6.10 Structure of the total CO_2 emission in the Capital City of Podgorica per sector and energy type in 2008

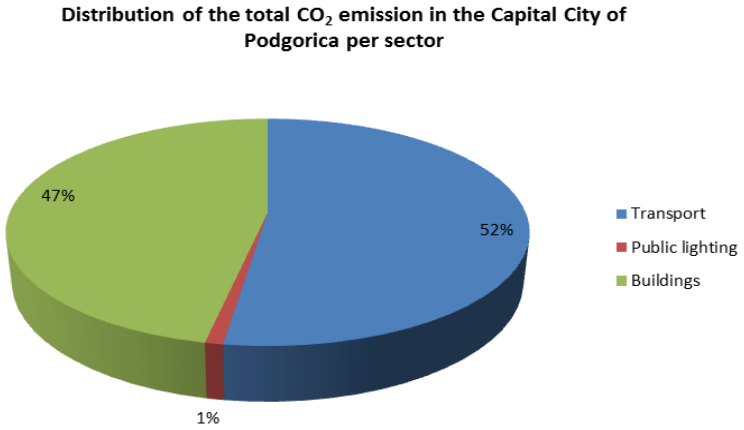

Figure 6.11 Distribution of the total CO_2 emission in the Capital City of Podgorica per subsector

Total emission inventory is 571.19 kt CO_2. The largest emission source, and the source of energy consumption, is the transport sector with the emission amounting to 298.67 kt CO_2 (52.29%), followed by the buildings sector with the emission of 267.12 kt CO_2 (46.76%), and the public lighting sector with 5.40 kt CO_2 (0.95%) (Figure 6.10).

6.6. Conclusion

Researches conducted so far have shown that over 50% of total greenhouse gas emission is generated in cities and their surrounding areas. Further, it is estimated that 80% of population in European Union in fact lives in cities. Having in mind the above stated, it can be concluded that the role of the city authorities is particularly important for mitigation of climate changes and environment protection both at the

city level, and the national and global level. The Baseline Emission Inventory of the Capital City of Podgorica for 2008 includes direct (fuel burning) and indirect (electricity consumption) CO_2 emission from the three sectors of direct energy consumption: buildings, transport and public lighting. Total CO_2 emission from the stated sectors in the Capital City of Podgorica was 571.19 kt CO_2 in 2008.

7. Overview of general measures and activities for CO_2 emission reduction by 2020

7.1. Introduction

According to the developed methodology for elaboration of this Action Plan, and in accordance with the European Commission recommendations, the overview of general measures and activities for CO_2 emission reduction by 2020 includes the identified measures for energy efficiency and use of renewable energy sources for the buildings, transport and public lighting sectors of the Capital City of Podgorica.

Measures for the buildings and transport sectors are divided into several subcategories depending on the subsector they refer to. A special subcategory for the buildings and transport sectors includes measures provided for in the national legislation. Measures for the improvement of the public lighting energy efficiency are, compared to the buildings and transport sectors, far smaller in number and are not divided into special categories.

This chapter provides an overview of all measures whose implementation would result in reduction of CO_2 emission in Podgorica, regardless of the investment costs, energy saving potential and economic and energy cost-efficiency of their realization. Descriptions of the economic and energy cost-efficient measures applicable by 2020, the expected energy savings and the associated CO_2 emission, realization time frame, assessment of investment costs and the bodies in charge of their implementation are provided for in the final part of the document.

7.2. Measures provided for in the national legislation

7.2.1. Buildings

Measures for increase of energy efficiency in the buildings sector are provided through the Energy Efficiency Strategy of Montenegro and the Energy Industry Development Strategy by 2025 (adopted in 2005, i.e. December 2007). The Action Plan was developed in order to implement the Strategy. According to the Action Plan, three basic action focuses are to be developed in parallel and they relate to:

- Establishing of the basic EE framework (the EE Law, the central EE institution and the EE Fund), as well as gradual development of the legislative and institutional framework for EE;
- Implementation of sectoral EE programmes, including ensuring incentives, technical assistance and promotional / marketing activities;
- Promotion of investments in the field of EE, through mobilization of international financial assistance, national and local funds, as well as private capital.

The Action Plan provides for the following energy efficiency measures in the buildings sector (in general):

- Introduction of urgent measures for implementation of the existing regulation on thermal insulation, with parallel publicity and informative campaign towards potential owners and leaseholders, in order to create demand in the market and put pressure on the market actors for adequate construction of energy efficient buildings and systems;
- Introduction of the energy efficiency concept and provisions into the legislation;
- Development of a new regulatory framework along with introduction of the concept of general requirements to meet the energy characteristics of buildings, and, in the next phase, introduction of certification of energy performance of buildings, in accordance with Directive 2002/91/EC on the energy performance of buildings;
- Introduction of energy labeling schemes and the minimum efficiency requirements for energy consumer devices and equipment;
- Regulations for introduction of individual measurement and calculation of energy costs according to the actual consumption;
- Measures for promotion of low energy buildings and use of sustainable energy sources in buildings (in particular active and passive solar systems).

Further analysis of the legislative framework and regulations provides for identification of measures for individual buildings sectors:

Energy efficiency measures applicable in the household sector:

1. Adoption and implementation of all bylaws arising from the Law on Spatial Development and Construction of Buildings (“Official Gazette of Montenegro”, no. 51/08) and the Energy Efficiency Law (“Official Gazette of Montenegro”, no. 29/10);
2. Continuous implementation of awareness raising campaigns for citizens
3. Labeling of household appliances with energy efficiency label as an indicator of the energy efficiency class and adoption of minimum requirements – standards;
4. Physical and legal persons using renewable energy sources can use financial incentives intended for energy efficiency projects.

Energy efficiency measures applicable in the commercial service sector:

1. Adoption and implementation of all bylaws arising from the Law on Spatial Development and Construction of Buildings (“Official Gazette of Montenegro”, no. 51/08) and the Energy Efficiency Law (“Official Gazette of Montenegro”, no. 29/10);
2. Implementation of regular energy inspections of heating boilers and air-conditioning system;
3. Continuous implementation of awareness raising campaigns for employees in the service sector**;**
4. Legal persons using renewable energy sources can use financial incentives intended for energy efficiency projects**;**
5. Determining tax, customs and other allowances for legal persons and entrepreneurs using technologies, products and trading with products that contribute to improvement of energy efficiency.

Energy efficiency measures provided for within the legal competences and responsibilities of the Capital City of Podgorica are the following:

Pursuant to the Energy Efficiency Law ("Official Gazette of Montenegro", no. 29/10)**:**

1. Adoption of the Energy Efficiency Improvement Program in accordance with the Strategy and the Action Plan. The Program is adopted for a three-year period and it covers: Proposal of EE measures, dynamics and method of implementation as well as the scope of the necessary funds and the method to provide the funds;
2. Adoption of the annual Energy Efficiency Improvement Plan for the purpose of implementation of the EE Improvement Program;
3. Energy management in buildings, i.e. facilities used, which includes, apart from the activities relating to energy efficiency improvement, introduction of the employees to the energy efficiency measures;
4. Informing the citizens on the possibilities to improve energy efficiency and the importance and effects of implementation of these measures;
5. Determining support measures for energy efficiency improvement in its area;
6. Establishing and management of energy consumption information system;
7. Introduction of the energy efficiency criteria into the public procurement procedure for goods and services and purchase or lease of buildings;
8. Provision of energy inspections in buildings with more than 1,000 m^2 floor area;
9. Displaying visibly on buildings boards with basic data from the energy certificate of the building;
10. Establishing information system to monitor energy consumption in the buildings used;
11. Delivery of data to the Ministry on the annual energy consumption in buildings and facilities used.

Pursuant to Article 66, and relating to Art. 63, 64 and 65 of the Law on Spatial Development and Construction of Buildings (“Official Gazette of Montenegro”, no. 51/08) and the Statute of the Capital City (“Official Gazette of the Republic of Montenegro – General Regulations“, no. 28/06), the Assembly of the Capital City–Podgorica passed the decision on compensation for installation of utilities on construction land (“Official Gazette of Montenegro - General Regulations“, no. 11/09

and 39/10) providing for the method of calculation and the amount of compensation for installation of utilities on construction land in accordance with the Development Program of the Capital City. To that regard, the compensation set in the Decision is reduced by €120.00 per 1 m^2 of the installed solar collector – panels in buildings using the solar energy systems for: sanitary water heating, cooling or electricity generation.

7.2.2. Transport

Applicable legal regulations and the adopted strategic documents recognized certain issued relating to the transport sector and defined measures for energy efficiency increase in this field accordingly, as follows:

1. Gradual development of the entire legislative, regulative and institutional framework for energy efficiency based on the relevant EU directives and standards in the field of transport, as well as establishing of mechanisms for their adequate application and implementation;
2. Supply of liquid fuels requires provision of storage capacities for mandatory oil derivate reserves for ninety days pursuant to Directive 98/93/EC according to the final derivative consumption scenario by 2025;
3. Promotion of energy efficiency in transport: trainings for drivers, efficient vehicle maintenance, management schemes for the public transport fleet and organization of management of a large number of vehicles;
4. Public awareness raising campaign on the procurement / use of energy efficient vehicles / vehicles using alternative fuels, on the efficient vehicle maintenance and driving regime with low consumption.

Further, **the Decree on the Limit Values of the Pollutant Content in Liquid Petroleum Fuels ("Official Gazette of Montenegro", no. 39/10)** provides for the conditions, limit values of the pollutant content and other fuel characteristics in view of environment protection to be met by fuels traded in the national market, as well as the method for determining and monitoring fuel characteristics.

Also, a significant number of framework documents set the target to increase the share of biodiesel fuel to at least 10%.

Detailed descriptions of the mentioned legislation and framework documents which, among other, provide for responsibilities of the Capital City regarding reduction of energy consumption and stimulating use of renewable energy sources in the buildings and transport sectors are presented in a separate chapter of this document.

7.3. Measures for CO_2 emission reduction in the buildings sector in the Capital City of Podgorica

Pursuant to the European Commission recommendation and the specific situation in the Capital City, the priority measures and activities for the buildings sector are divided into the following five subcategories:

- general measures for CO_2 emission reduction in the buildings sector;

- promotional, informative and educational measures and activities;
- measures for residential and public buildings owned by the Capital City;
- measures for residential buildings sector;
- measures for residential commercial and service buildings.

7.3.1 General measures for CO_2 emission reduction in the buildings sector

The category of general measures includes measures relating to the buildings sector of the Capital City of Podgorica as a whole, and they can be divided in two subgroups:

- measures eliminating barriers in monitoring and control of energy consumption in the buildings sector of the City;
- cofinancing schemes for the implementation of the identified energy efficiency measures in all subsectors.

Measures eliminating barriers in monitoring and control of energy consumption in the buildings sector of the Capital City:

1. Adoption of the methodology to collect the relevant energy indicators for the buildings sector in the Capital City according to the classification of buildings used in this Action Plan (1. buildings owned by the Capital; 2. residential buildings; 3. commercial and service buildings);
2. Collecting relevant energy indicators according to the developed methodology at annual, monthly and daily level (depending on the indicator type), using automatic remote reading systems in collecting, and reading by employees for additional verification of their accuracy;
3. Development of energy management information system for the Capital City, which will include all collected data and indicators and allow conducting of all required analyses;
4. Development of annual energy balance for the Capital City i.e. the total annual energy consumption in buildings, according to Montenegrin regulations and the classification of buildings in this Action Plan.

We should note that these are very important measures, since it is impossible to monitor the actual developments in energy consumption without collecting relevant energy indicators according to uniform methodology, and also the associated CO_2 emission from the buildings sector. Generally, this means that, without uniform methodology, it will not be possible to determine whether the target set in this Action Plan is achieved by 2020 or not.

The following subgroup of general measures, that has significant effect on CO_2 emission reduction in the City of Podgorica by 2020, is establishing of a cofinancing scheme for the implementation of the identified energy efficiency measures in the buildings sector as a whole. Experiences of all energy responsible and developed European cities show that, without cofinancing programs and other various support programs of city administration, we cannot expect to have significant implementation

of energy efficiency measures, which would result in CO_2 emission reduction by over 20% by 2020.

The proposed general measures for this subgroup are:

1. Development of the methodology and study and implementation of support schemes of the Capital City (grants, subsidies etc.) for construction and reconstruction of buildings in accordance with low energy and passive standards.
2. Implementation of support schemes of the city and development of new ones (grants, subsidies etc.) for the use of renewable energy sources in buildings (photovoltaic systems, solar collectors, biomass boilers, thermal pumps etc.).

The characteristic of this group of measures is that it is very difficult to give quantitative estimate of their effect on energy saving and the associated CO_2 emission reduction, but it is certain that it will not be possible to meet the set target of CO_2 emission reduction by over 20% by 2020 without their implementation.

7.3.2. Promotional, informative and educational measures and activities

The subcategory of promotional, informative and educational measures and activities aimed at CO_2 emission reduction on one part, and improvement of the quality of life for all citizens of the Capital City of Podgorica on the other part, includes the following measures:

1. Continuance and improvement of work, and opening of new energy efficiency (EE) info centers
2. Opening of energy efficiency info corner in the city administration buildings (EE info corner);
3. Installation of EE info showcases in various parts of the Capital City;
4. Continuous informing of consumers on the energy saving methods and current energy topics on the back of electricity bills (in agreement with various energy distribution companies);
5. Implementation of thematic promotional - informative campaigns to raise awareness among citizens on energy efficiency in buildings:
    - How to build an energy efficient home?
    - Reconstruction of buildings according to the principles of sustainable construction;
    - Energy certificates – energy consumption as a market category in purchasing, leasing and rehabilitation of buildings;
    - Energy efficiency measures in households – thermal static vents, solar systems for sanitary water heating, energy efficient doors and windows, home appliances with energy class A;
    - Energy efficiency labels – Why should we buy only appliances with energy class A?;
    - Even "stand-by mode" consumes electricity! – switching off home appliances after use;
    - Energy saving interior lighting;
    - Biomass heating;
    - Solar collectors;

- Thermal pumps;
- Smart buildings – What is that?;
- What is low energy ("three-litre") house?;
- What is passive ("one-litre") house?;
- What is *Factor 10*?;

6. Organization of promotion events on rational use of energy and CO_2 emission reduction:
7. Educational campaigns on sustainable designing, construction and use of buildings for target groups of citizens:
    - Organization of debates in certain city areas on the topic of energy efficiency;
    - How to save energy? – for kindergarten and primary school children;
    - Actions in schools: competitions for essays or drawings on the topic of climate change and energy saving, awarding prizes and exhibition of works;
    - Preparation and distribution of picture books for children on the topic of energy efficiency and use of renewable energy sources;
8. Stimulating energy efficiency and sustainable construction on architectural and urban-architectural competition invitations for the territory of the Capital City:
    - New construction competitions;
    - Reconstruction competitions;
    - To introduce into energy efficiency and sustainability into competition programs (project tasks) as a valuation category, with up to 20% share in the total project assessment.

It is very difficult, as for the general measures, to assess quantitative effect of this category of measures to energy saving and the associated CO_2 emission reduction. Based on experiences of energy responsible European cities, it was estimated that continuous implementation of the above stated promotional, educational and informative measures would result in total thermal energy saving in the entire buildings sector in the Capital City of Podgorica of about 11%.

7.3.3. Measures for buildings owned by the Capital City

Identified energy efficiency measures for buildings owned by the City, according to the basic characteristics, can be divided into three groups:

- preparatory activities;
- projects that can be implemented;
- legislative measures.

The set of preparatory activities includes the following measures and activities:

1. Introduction of energy management information system in buildings owned by the City:
    - centralized collecting of all relevant data on buildings (construction characteristics, years of construction, year and description of reconstructions, energy consumption of all types of energy, monthly energy bills etc.);

- remote reading system for energy consumption;
- creation and continuous updating of the buildings register;
- implementation of energy inspections in buildings;

2. Introduction of 50-50% scheme, according to which the achieved energy saving, i.e. avoided energy costs are equally divided between the city administration as the owner of the building and the user of buildings. The present practice according to which user of buildings (e.g. in our case the secretariats, etc.) realizing energy saving through their conscious behavior, without any final gain for themselves, is very demotivating. Many experiences show that implementation of 50-50% scheme, as a strong motivational factor, results in change in behavior of the building users which in principle significantly reduces energy consumption.

Overview of specific projects, whose implementation directly affects energy consumption and the associated CO_2 emission reduction, is very long, and the ones proposed here are the ones whose effect on CO_2 emission reduction is the highest:

1. Installation of solar systems for sanitary water heating in cultural, sports and administration buildings owned by the City;
2. Replacement of lighting fittings in educational institutions in the City with modern and energy efficient lighting technical solutions in accordance with the European norms and directives;
3. Thermal insulation of façades and roofs of buildings owned by the City;
4. Installation of saving bulbs in all buildings owned by the City;
5. Installation of highly energy efficient windows in buildings owned by the City;
6. Installation of thermometers in each room in all buildings owned by the City.

Legislative measures at the City level which will result in significant CO_2 emission reduction are:

1. Introduction of Green Public Procurement for all equipment and services in buildings owned by the Capital City;
2. Adoption of the Decision on Municipal Fee with significant discount for construction of low energy and passive buildings
3. Introduction of new construction documentation to stimulate use of renewable energy sources and energy efficiency and natural gas.

7.3.4. Measures for the residential sector of the Capital City

Energy efficiency measures for this subsector can be divided into measures for new and for the existing buildings. Reduction of consumption in new buildings will be most effective through adoption of regulations which will restrict energy consumption. Successful implementation of the stated regulation will result in significant reduction of consumption in new residential buildings.

Energy efficiency measures for the existing residential buildings include 3 categories:

- preparatory activities;
- projects that can be implemented;
- legislative measures.

Preparatory activities, as in the case of the buildings subsector owned by the Capital City, are all those measures that will not directly affect reduction of energy consumption and the associated CO_2 emission but will set the necessary preconditions for their successful implementation.

The following measures were identified for this category:

1. Cofinancing reconstruction of facades and roofs of buildings based on sustainable construction principles;
2. Cofinancing installation of solar water heating systems.

Energy efficiency projects that can be implemented for the existing and future residential buildings sector, whose implementation directly affects energy consumption and the associated CO_2 emission reduction are numerous, and the ones suggested here are the ones whose effect on CO_2 emission reduction is the highest:

1. Installation of solar water heating systems in households by 2020;
2. Reconstruction of thermal insulation of exterior walls and rehabilitation of roofs based on sustainable construction principles for the existing residential buildings by 2020;

It is necessary to develop and initiate a subvention program for successful implementation of the identified specific projects.

7.3.5. Measures for commercial and service buildings

Energy efficiency measures for this subsector can, generally, be divided into measures for new and existing commercial and service buildings in the territory of the Capital City.

Proposal of the measures for the existing buildings in the commercial and service sector includes the following measures and activities:

1. conditioning incentives by improvement of thermal insulation of building above the limits prescribed by regulations
2. conditioning incentives by use of renewable energy sources:
    a. photovoltaic systems;
    b. thermal pumps
    c. solar collectors;
3. stimulating purchase of energy efficient electrical devices;
4. installation of saving bulbs

7.4. Measures for CO_2 emission reduction in the transport sector of the Capital City of Podgorica

In accordance with the European Commission recommendations and the actual situation in the Capital City, the proposed measures and activities for the transport sector are divided into the following subcategories:

- Planned measures for CO_2 emission reduction in the transport sector;

- Promotional, informative and educational measures and activities;
- Green public procurement;
- Measures for vehicles owned by the Capital City;
- Measures for public transport;
- Measures for private and commercial vehicles.

7.4.1. Planned measures for CO_2 emission reduction in the transport sector of the Capital City of Podgorica

The subcategory of planned measures for CO_2 emission reduction in the transport sector of the Capital City of Podgorica includes all the measures whose successful realization will result in general improvement of the quality of city transport as well as significant CO_2 emission reduction.

According to the Spatial Plan of the Capital City, the basic objectives for development of transport and infrastructure system are:

- development of transport and infrastructure system according to the needs and directions of the planned spatial development of the City;
- rational use of the existing capacities and natural resources through sustainable planning of the necessary infrastructure;
- improvement of transport connections of the city area with the broader region;
- transport infrastructure system which is safe and efficient, spatially developed with a possibility to implement specific solutions based on improvement of city network and local roads;
- revitalization of the existing and construction of new municipal infrastructure in accordance with the development planning presumptions to form residential blocks.

Regarding the activities realized or planned which are significant for the Action Plan, the following are relevant:

- construction of a mini-bypass road – consideration of the possibility to increase the number of streets in Zone I intended solely for pedestrians;
- reconstruction and supplementing of the existing road network;
- reconstruction of the existing railway infrastructure and creating possibilities to use its potential for passenger transport;
- improvement of the existing network of city and suburban transport lines by introducing new lines or changing line routes depending on the potential demand and optimization of transport services.

The category of planned measures for CO_2 emission reduction in the transport sector include the following measures:

1. Relocation of transport from zone I
    - Results of certain parameters measured in locations next to frequent roads in the city center show that the growing transport volume in the city area causes disturbance in the environment quality, and therefore

this matter needs to be resolved. Accordingly, the Capital City has initiated activities to create planning and investment presumptions for construction of a mini-bypass road, as a key road which will largely contribute to mitigate this problem.
- Establishing temporary measure such as days/locations without cars, as well as permanent measures such as establishing certain streets or areas as exclusively pedestrian zones.

2. Introduction of information system for transport surveillance;
    - Measure establishing traffic signal system – computer controlled systems in specific areas/routes for optimization of traffic flow (e.g. green waves);
    - Measure introducing technology for detection/locating and foreseeing incidents and establishing management of potential incident situations.
3. Measures for faster flow and circulation of traffic in the territory of the Capital City of Podgorica;
    - Establishing specific transport infrastructure solutions to accelerate the flow of traffic participants (roundabouts);
    - Defining traffic solutions by appointing special lanes for public transport vehicles ensuring their priority in crossroads through an appropriate system;
    - Restricting traffic of trucks in streets in the city centre that are characterized by traffic congestion, especially in certain time intervals.

4. Introducing traffic pollution charges;
    - Based on the experience of other cities, it is necessary to consider the possibility of introducing charges for traffic pollution of the Capital City centre. This measure would lead to reduction in the use of private vehicles and increased use of public city transport. The funds collected from such traffic pollution charges can be invested in improvement of the quality of public city transport service.

5. Measures to increase traffic safety in the Capital City of Podgorica.

7.4.2. Promotional, informative and educational measures and activities

Promotional, informative and educational measures and activities aimed at improvement of the quality of transport and CO_2 emission reduction in Podgorica are as follows:

1. Reduction of passenger vehicles;
2. Potential transfer to alternative transport type: pedestrian, bicycle or public transport;
3. Organizing public awareness campaign on reduction of the negative effect of vehicles (cars that are maintained regularly are more efficient, and they have lower CO_2 emission, insufficiently inflated tires increase fuel consumption by up to 4%, unnecessary use of air-conditioning increase fuel consumption and CO_2 emission by up to 5% …);

4. Campaign: Say YES to public transport;
5. Implementation of the Campaign in media on rational use of water, electricity, cars (Campaign: One day a week without cars; It is healthier by bike! Invitation for joint use of cars – "car sharing" model);
6. Promotion of the use of alternative fuels;
7. Organization of informative-demonstration workshops for citizens on the use of vehicles that use alternative fuels (electricity, gas, biogas etc.) with possibility to rent vehicles that use alternative fuels;
8. Celebration of the European Mobility Week in the Capital City;
9. Organization of debates, workshops and round tables, conducting surveys and researches, distribution of informative and promotional materials etc.

7.4.3. Green public procurement

This subcategory of measures include the following measures and activities:

1. Introduction of the green public procurement criteria for vehicles owned by the Capital City;
2. Introduction of the green public procurement criteria for vehicles of the public city transport.

7.4.4. Measures for vehicles owned by the Capital City of Podgorica

1. Procurement of new vehicles with reduced greenhouse gas emission (alternative fuels) in accordance with the green public procurement criteria.
2. Car sharing for officers in the same enterprise of the Capital City of Podgorica i.e. city administration body.

7.4.5. Measures for public transport of the Capital City

Measures for public transport in the Capital City include all the measures that increase the use of public transport through improvement of its quality, thus reducing the use of private cars. Although implementation of those measures will not initially reduce CO_2 emission in the Capital City, significantly lower use of private cars will still lead to its reduction.

Measures for public transport in the Capital City of Podgorica are divided into 3 groups depending on the type of transport:

- measures improving the quality of bus transport;
- measures improving the quality of railway transport;
- measures improving bicycle transport in the territory of the Capital City.

According to the above stated, the subcategory of measures for public transport includes:

1. Measures improving the quality of bus transport:

a. Establishing and modernization of public city transport by using buses that use biodiesel or other type of alternative fuel;
b. Stimulating balanced development of transport coverage leading to significant reduction of unnecessary transport and at the same time stimulating and using the types of public transport that have the lowest variations and the highest capacity use , and which are therefore the most cost-efficient energy consumers.
c. Development of bus stops and shelters and installation of LED displays signaling bus arrival in all bus stops;
d. Replacement of standard buses with mini-buses in evening hours in lines that are expected to have lower number of passengers;
e. Considering the option to introduce tram public transport;
f. Stimulating production of biodiesel from edible waste oil for public bus transport;

2. Measures improving the quality of railway transport:

   a. Redirecting cargo and passenger transport to railway transport;
   b. Expanding the system of city and suburban transport in Podgorica,
   c. Introducing new motor trains in city and suburban transport;
   d. Adjusting train timetable to the actual needs of the citizens – in the period of regular transport of a large number of citizens to work in Podgorica (5.30 – 8 a.m.) and their higher frequency, every 40 min.

3. measures improving bicycle transport in the territory of the Capital City:

   a. Establishing network of bicycle rental stations equipped with IT protection against theft;
   b. Construction of new ones and continuous maintenance of cycling paths in the entire territory of the Capital City.

7.4.6. Measures for private and commercial vehicles

Proposal of measures rationalizing the use of private and commercial vehicles in the territory of the Capital City include the following measures:

1. Tariffing and charging entry into the city center for conventional vehicles;
2. Lower tariff for entry into the city center for vehicles using alternative fuels**.**

7.5. Measures for the public lighting sector

Proposal of measures reducing electricity consumption and light pollution in the public lighting sector of the Capital City of Podgorica includes implementation of the following:

1. Replacement of the existing ones with energy efficient and environmentally friendly light fittings (replacement of the remaining lights containing mercury with high pressure sodium bulbs, LED technology lights, and implementation

of solar lighting in the territory where it is not possible to realize classic lighting and it is needed in specific locations where it is cost-efficient);
2. Replacement of the existing electromagnetic ballasts in lights and installation of modern electronic ballasts, creating the option remote light management;
3. Installation of astronomical internal clocks that switch on public lighting at the exact specified time, depending on the geographic position. In that way we avoid unnecessary lighting use, i.e. earlier switching on and/or switching off;
4. Construction of supervision center for public lighting and traffic lights management;
5. Procurement and implementation of appropriate software for public lighting surveillance and management system within the supervision center;
6. Creating presumptions to obtain the status of 10 kV consumer for the public lighting consumption category;
7. Development of public lighting geographic-information system in the territory of the Capital City;
8. Reconstruction of old connections to the electricity distribution network, which would lead to certain energy saving.

As already mentioned in the introduction, this chapter gives an overview of all measures and activities in the buildings, transport and public lighting sectors whose successful implementation would result in CO_2 emission reduction. Chapter 8 of this Action Plan presents the main implementation parameters for a part of the identified, economic-energy optimal measures for all 3 energy consumption sectors in the Capital City of Podgorica: time, responsible institution, potential energy savings and the associated CO_2 emission, investment costs, investment return period etc.

8. Timeframe and financial framework for the realization of the plan of measures and activities of the Capital City of Podgorica

8.1. Introduction

The previous chapter provided a comprehensive overview of the identified measures and activities of the Sustainable Energy Action Plan of the Capital City of Podgorica, in the period from 2008 to 2020, for the buildings, transport and public lighting sectors. In order to achieve the planned result, with economically realistic assumptions from the above-stated scope of envisaged measures whose implementation will contribute to the reduction of CO_2 emissions, the most optimal energy-economic ones were selected. By application of the planned measures we can expect reduction of emissions by 21%. Hence, for accomplishing the set up objective of reducing CO_2 emissions of 21% by 2020 in relation to the baseline year 2008, it will be sufficient to implement a part of the given measures, which will primarily depend on financial, time and organizational parameters.

The identified measures of energy efficiency will be given hereafter in this Chapter in a tabular overview, whereas the following parameters will accompany each of the measure:

- implementation timeframe;
- authority in charge of implementation;
- assessment of implementation investment costs;
- assessment of expected energy savings;
- assessment of CO_2 emission reduction;
- investment costs as per saved tCO_2;
- possible sources of implementation funds;
- brief description of the measure and method of implementation.

The measures with the accompanying parameters will be divided into the following categories:

- measures for CO_2 emission reduction from the buildings sector of the Capital City of Podgorica;
- measures for CO_2 emission reduction from the transport sector of the Capital City;
- measures for CO_2 emission reduction from the public lighting sector of the Capital City.

Possible sources for implementation of each measure will be given as per the entries of Chapter 10 of this document.

8.2. Measures for CO_2 emission reduction in the buildings sector of the Capital City of Podgorica

Hereafter we provide the overview of measures for CO_2 emission reduction from the buildings sector of the Capital City Podgorica, divided into four categories:

- Promotion, education and changing behavior;
- Residential and public buildings owned by the City;
- Residential buildings;
- Buildings of commercial and service activities.

Chapter 7 also provides an overview of measures that have been classified under the category of General Measures, which are primarily oriented to the activities such as development of methodology for collecting and reviewing the relevant indicators on energy consumption in the buildings sector, as well as to the development of different studies and bases for introduction of specific measures.To that effect, the category of General Measures basically contains the preparatory activities for implementation of the other measures, and therefore, their implementation does not result in direct energy savings, that is, reduction of the emission of greenhouse gases.

8.2.1. Education, promotion and changing behaviour

Measures/activity	1. Education and changing the behaviour of employees/beneficiaries of buildings owned by the Capital City of Podgorica
Holder of activities	• The Capital City of Podgorica, • Energy Efficiency Office

Start/end of the implementation (years)	2011 - 2020
Cost estimate (unit price or total per measure)	cca €10,000 a year, total €90,000
Savings estimate (% or kWh, fuel litres)	1,670 MWh
Estimate of reduction of emission (t CO_2)	794.92
Costs per reduction of emission (€/t CO_2)	113.22
Source of funding	• Budget of the Capital City of Podgorica • IPA component II - Cross-border cooperation
Short description/ comment	The measure includes a set of educational activities that are carried out regularly: • Organization of educational workshops on the energy saving methods; • Preparation and distribution of educational materials (leaflets, brochures, posters, stickers etc.) • Organization of debates and similar. In addition to the educational activities, within this measure it will be necessary to introduce the methods of stimulating energy savings (e.g. scheme 50/50) where a part of the funds obtained from the accomplished energy savings will remain available to a particular institution where the respective savings have been made (e.g. institutions to which the Capital City is paying the costs of the consumed electricity). It is very difficult to present quantitatively the energy savings obtained by implementation of measures focused on raising awareness and education of employees in the buildings owned by the Capital City. According to the experiences of other European cities it was assumed that the continuous educational, promotional and informative activities in the following ten year period will result in thermal energy savings of 20% and electricity savings of 10% in relation to the baseline year 2008, in the buildings owned by the Capital City. Since it is the characteristic of the structures owned by the Capital City of Podgorica to have heating/cooling solely with electricity, the estimated electricity savings will be cca 15%, that is, 1,670 MWh electricity by 2020.

Measures/activity	2. **Education of citizens and promotion of energy efficiency**
Holder of activities	• The Capital City of Podgorica, • Office of energy efficiency
Start/end of implementation (years)	2011 - 2020
Cost estimate (unit price or total as per the measure)	cca €10,000 a year, total € 90,000
Savings estimate (% or kWh, litre of fuel)	42,661 MWh electricity 3,738 MWh thermal energy from fuel wood
Estimate of reduction of emission (t CO_2)	20,306.64
Costs as per the reduction of emission (€/t CO_2)	4.43
Source of funding	• Budget of the Capital City • Donors • Eco fund

Short description/ comment	The measure includes numerous activities that are implemented regularly: 1. Continuing to establish the EE info offices in different parts of the city (so far, one info center has been opened in the centre of the Capital City); 2. Setting up EE info showcases in different parts of the city; 3. Permanent informing of consumers about the methods of energy savings and current energy topics on the back of energy bills; 4. Carrying out the thematic promotional-informative campaigns for raising the citizens' awareness on energy efficiency in the buildings: • How to build an energy efficient house?; • Reconstruction of buildings on principles of sustainable construction; • Energy certificates – energy consumption as the market category when buying, renting or rehabilitating buildings; • Measures of energy efficiency in households - thermostatic valves, solar systems for preparing the hot water consumption, energy efficient doors and windows, household appliances of energy class A; • Energy efficiency labels –Why we should buy only the devices of energy class A?; • Even stand-by mode consumes electricity! – switching off te household appliances after use; • Saving interior lighting; • Biomass heating; • Solar collectors; • Heat pumps; • Intelligent building - what's that?; • What is a low energy („three-litre“) house?; • What is a passive („one litre”) house?; • What is factor 10?; 5. Organization of events promoting rational energy consumption and reduction of CO_2 emission: Energy savings obtained by undertaking measures on raising awareness and education of different target groups is very difficult to present quantitatively. According to the experiences of other European cities it was assumed that the continuous educational, promotional and informational activities in the period from 2011 to 2020 in the territory of the Capital City of Podgorica will result in total electricity savings in residential and service-commercial sectors (for heating and non-heating purposes) of 10% and savings in wood in the residential sector by 7%.

8.2.2 Residential and public buildings owned by the Capital City of Podgorica

Measures/activity	3. Placing of solar collectors for the use of hot water on residential buildings owned by the Capital City
Holder of activities	• The Capital City of Podgorica • Housing Agency
Start/end of the implementation (years)	2010 - 2020
Cost estimate (unit price or total as per the measure)	600 €/m^2 of solar system
Savings estimate (% or kWh, litre of fuel)	74.12 MWh electricity
Estimate of reducing emissions (CO_2)	35.28
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • IPA program • Home owners
Short description/comment	This measure includes installation of solar collectors on 6 residential structures (net area of 6,303 m^2) owned by the Capital City, by 2020, for the use of hot water and heating of premises. It was estimated that total electricity consumption for purposes of heating the premises and preparation of hot water in residential buildings owned by the Capital City in 2008 was 617.7 MWh. Expected thermal energy savings for preparation of hot water is 12%.

Measures/activity	4. Modernization of lighting in 100 offices in administrative buildings owned by the Capital City Podgorica
Holder of activities	The Capital City of Podgorica
Start/end of the implementation (years)	2011 - 2020
Costs estimate (unit price or total as per the measure)	€67,500 total
Savings estimate (% or kWh, litre of fuel)	8.65 MWh electricity total
Estimate of reducing the emission (t CO_2)	4.12
Costs as per the reduction of emissions *(€/t* CO_2)	16,383.49
Source of funding	• Budget of the Capital City of Podgorica • EU Funds • Investment and Development Fund of Montenegro
Short description/comment	Estimate of costs for an average office (29 m2) is €675. Savings estimate for an average office is 86.5 kWh of electricity a year. Total investment is €67500, and total electricity savings in 100 offices by 2020 will be cca 8,650 kWh.

Measures/activity	5. Installation of thermometers in each room of the business buildings owned by the Capital City
Holder of activities	The Capital City of Podgorica
Start/end of the implementation (years)	2011

Cost estimate (unit price or total as per the measure)	1.5 €/thermometer, cca €1,500 total
Savings estimate (% or kWh, litre of fuel)	284 MWh electricity
Estimate of reducing the emission (t CO_2)	135.18
Costs as per the reduction of emissions (€/t CO_2)	11.10
Source of funding	• Budget of the Capital City of Podgorica
Short description/comment	Installation of thermometers on the walls of each room (offices, conference rooms, etc.) will enable insight into the temperature status and possibility of temperature management by aerating the room and regulating heating/cooling of the room. In addition to setting up thermometers on the wall of each room, the measure will also include the initial educational activity: • The thermometer itself will have the label saying "1°C SAVES UP TO 6% OF ENERGY". • When setting up thermometer in the room the users will be notified about the purpose of the measure as well as how to implement it successfully. • Preparation and distribution of leaflets, etc. Estimate of total investment costs, together with the assumed 1,000 premises in all of the buildings owned by the Capital City will amount cca €1,500. According to the foreign experiences, this measure will result in 4% reduction of thermal energy in buildings owned by the Capital City. The proposal is to start implementing this measure as soon as possible because it is not demanding in neither financial nor contracting sense.

Measures/activity	6. Thermal insulation of the exterior cladding and roof for 10 buildings owned by the Capital City of Podgorica
Holder of activities	The Capital City of Podgorica
Start/end of the implementation (years)	2011 - 2020
Cost estimate (unit price or total as per the measure)	€120,000
Savings estimate (% or kWh, litre of fuel)	480 MWh electricity
Estimate of reducing the emission (t CO_2)	228.48
Costs as per the reduction of emission (€/t CO_2)	525.21
Source of funding	• Budget of the Capital City • Credit funds • Investment and Development Fund of Montenegro
Short description/comment	Complete renewal of thermal insulation of the facade and the roof in 10 structures owned by the Capital City. The total area of buildings that are going to be thermally insulated is around 6,000 m^2. The estimated thermal energy savings is around 80 kWh/m^2, and investment costs around 20€/m^2.

Measures/activity	7. Installation of energy highly efficient windows in 10 buildings owned by the Capital City
Holder of activities	The Capital City of Podgorica
Start/end of the implementation (years)	2011 - 2020
Cost estimate (unit price or total as per the measure)	€180,000
Savings estimate (% or kWh, litre of fuel)	210 MWh electricity
Estimate of reducing the emission (t CO_2)	99.96
Costs as per the reduction of emission (€/t CO_2)	1,800.72

Source of funding	• Budget of the Capital City • Credit funds • Investment and Development Fund of Montenegro
Short description/comment	Installation of energy highly efficient windows in 10 buildings owned by the Capital City. Total heated area in which we will install the energy highly efficient windows is around 6,000 m^2 . The estimated thermal energy savings is around 35 kWh/m2, and the investment around 30 €/m^2 .

Measures/activity	8. Introducing the criteria of Green Public Procurement for purchase of electrical devices for buildings owned by the Capital City
Holder of activities	• The Capital City of Podgorica • Public procurement services
Start/end of the implementation (years)	2011- 2020
Costs estimate (unit price or total as per the measure)	No costs
Savings estimate (% or kWh, litre of fuel)	283 MWh electricity
Estimate of reducing the emission (t CO_2)	134.71
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City
Short description/comment	Stimulating purchase of energy efficient electrical devices for all buildings owned by the Capital City, by introducing the Green Public Procurement. When purchasing the devices, the criteria will have to be defined and standardized in advance, and all of the new devices should meet the laid down criteria. The electricity savings potential of this measure, for buildings owned by the Capital City, will be 8% by 2020.

Measures/activity	9. Introduction of saving bulbs into the buildings owned by the Capital City of Podgorica
Holder of activities	• The Capital City of Podgorica
Start/end f the implementation (years)	2011- 2017
Cost estimate (unit price or total as per the measure)	No costs
Savings estimate (% or kWh, litre of fuel)	282 MWh electricity
Estimate of reducing the emission (t CO_2)	134.23
Costs as per the reduction of emission (€/t CO_2)	
Source of funding	• Budget of the Capital City
Short description/comment	As per the EU Decree on lighting products (EC Regulation 244/2009) it was anticipated that production of classic bulbs stops by 2016, which will result in replacing all of the classic bulbs by the saving ones. It is recommended to replace all of the classic bulbs in buildings owned by the Capital City by savings bulbs, by 2017. This measure will result in 7% reduction of total electricity consumption by 2020 in buildings owned by the Capital City.

Measures/activity	**10.** Adaptation of former building of PE Water Supply and Sewage Management in Vuka Karadzica Street
Holder of activities	• The Capital City of Podgorica • Agency for Construction and Development
Start/end of the implementation (years)	2010 - 2011

Cost estimate (unit price or total as per the measure)	€642,698.24
Savings estimate (% or kWh, litre of fuel)	550 MWh electricity
Estimate of reducing the emission (t CO_2)	261.80
Costs as per the reduction of emission (€/t CO_2)	2,454.92
Source of funding	• Budget of the Capital City
Short description/comment	It is a building owned by the Capital City, net area of 1,507.72 m^2 where energy consumption in 2008 was 160,872 kWh, and it is one of the oldest buildings used. It was built in 1954 and so far has suffered a series of adaptations and reconstructions and as such is a huge energy consumer. As it is situated in the attractive site, substantial funds were allocated for its adaptation from the budget, which will help obtain quality conditions to accommodate several services of the Capital City. Adaptation itself, among other things, includes thermal insulation of the structure's facade, replacement of exterior doors and windows, electrical and water supply installations and air-conditioning of the structure by heat pump system. The assumption is that after adaptation the structure is going to spend cca 38% energy less which will result, by 2020, in total savings of 550 MWh of electricity.

Measures/activity	**11.** Creating presumptions to obtain the status of 10 kV consumer for the consumption category for buildings owned by the Capital City
Holder of activities	• The Capital City of Podgorica • Building users
Start/end of the implementation (years)	2011 – 2016
Cost estimate (unit price or total as per the measure)	Implementation of this measure will not incur any costs, on the contrary, it will ensure the funds for the budget since it can be assumed that bills for the consumed electricity in buildings owned by the Capital City will be less by 20-25%.
Savings estimate (% or kWh, litre of fuel)	Since not all of the places meet requirements for application of the consumption category, it is estimated that this measure might reach the savings of 20 -25% of value of the consumed electricity bill. The energy consumption will be the same but significant financial savings effects will be accomplished for the budget of the Capital City.
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Monetary savings in the budget
Short description/comment	By changing the category of consumption from current one to "10 kV consumer" we will accomplish significant savings due to a lower price of kWh for the category of "10 kV consumer". Due to a huge financial profit for the Capital City, the proposal is to start its implementation immediately.

8.2.3 Residential sector (households) of the Capital City of Podgorica

Measures/activity	**12.** Installation of solar systems in 400 households in the territory of the Capital City of Podgorica
Holder of activities	• The Capital City of Podgorica • The Housing Agency
Start/end of implementation (years)	2011- 2020
Costs estimate (unit price or total as per the measure)	600 €/per system for 4 members household, total € 240,000
Savings estimate (%or kWh, litre of fuel)	1,615.2 MWh electricity
Estimate of reducing the emission (t CO_2)	768.84
Costs as per the reduction of emission (€/t CO_2)	312.16

Source of funding	• City budget • IPA program • home owners • Investment and Development Fund of Montenegro
Short description/comment	The measure includes installation of 400 solar collector systems for houses/appartments in total by 2020. For successful implementation of this measure it will be necessary to develop the model of subsidizing according to which a part of the costs will be borne by the Capital City and a part by the citizens.

Measures/activity	**13.** Introducing saving bulbs in all households in the area of the Capital City of Podgorica
Holder of activities	• Market law
Start/end of implementation (years)	2011 - 2018
Cost estimate (unit price or total as per the measure)	No costs
Savings estimate (% or kWh, litre of fuel)	26 044 MWh electricity
Estimate of reducing the emission (t CO_2)	12,396.94
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	
Short description/comment	Pursuant to the EU Decree on lighting products (EC Regulation 244/2009) it was anticipated that production of classic light bulbs is going to be stopped by 2016 and that all of the classic lights bulbs are going to be replaced by the saving ones. Assuming that the average household of the Capital City spends cca 27% of electricity on lighting, 32,555 MWh electricity was consumed for that purpose in 2008. Average saving bulb spends up to 80% energy less than a classic one, which will make the households in the area of the Capital City save 26 044 MWh in total by 2018.

Measures/activity	**14.** Thermal insulation of exterior cladding-facade of collective residential facilities by system of funding 50%-50%
Holder of activities	• The Capital City of Podgorica • The Housing Agency • Home Owners' Assembly
Start/end of implementation (years)	2011 - initial activity
Cost estimate (unit price or total as per the measure)	€ 400,000
Savings estimate (% or kWh, litre of fuel)	1,440 MWh electricity
Estimate of reducing the emission (t CO_2)	685.44
Costs as per the reduction of emission (€/t CO_2)	583.57
Source of funding	• Budget of the Capital City (50%) • Home owners' assembly (50%)
Short description/comment	Implementation of this measure has started in 2011 by preparation of thermal insulation of buildings. The façade rehabilitation project itself according to the funding system of 50% of the Capital City and 50% of home owners attracted interest of home owners and it can be claimed it will be reached for 2011. The Capital City has recognized the importance of making the thermal insulation and allocated substantial funds in the annual budget for this year (€200,000). Implementation of this measure will be affected by readiness of the home owners to fund the works. The total area of buildings that will be thermally insulated will be cca 18,000 m^2. Estimated thermal energy savings will be around 80 kWh/m^2, and investment costs around 20 €/m^2. Expected energy savings will be 1,440 MWh.

8.2.4. Buildings of commercial and service activities

Measures/activity	**15.** Amendment to the Decision on compensation for utility equipping of the construction site which will introduce the provision on decreasing the compensation for utility equipping of building facilities with designed energy consumption up to 45/15kWh/m^2 a year (according to the low energy, that is, passive standard)
Holder of activities	• The Capital City of Podgorica
Start/end of implementation (godine)	2013 - 2020
Costs estimate (unit price or total as per the measure)	It is necessary to amend the Decision on compensation for utility equipping of the construction site
Savings estimate (% or kWh, litre of fuel)	4,887 MWh
Estimate of reducing the emission (t CO_2)	2,326.21
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City
Short description/comment	By appropriate amendments of the Decision on compensation for utility equipping we should anticipate reduction of compensation for building the facilities that have been designed according to the low energy or passive standard, that is, that have the designed energy consumption up to 45 kWh/m2 a year (low energy standard), that is, 15 kWh/m^2 (passive standard). In accordance with foreign experiences, the estimated thermal energy savings will be 6% of the total consumption of thermal energy of this sub-sector in 2008 – 4,887 MWh. Before carrying out these measures it will be necessary to undertake a detailed analysis in order to identify the status, possibilities and methods for their implementation.

Measures/activity	**16.** Conditioning granting of subsidies by using renewable energy sources for generation of thermal energy
Holder of activities	• The Capital City of Podgorica
Start/end of implementation (years)	2013 - 2020
Cost estimate (unit price or total as per the measure)	It will be necessary to prepare the Rulebook with the criteria for awarding subsidies
Savings estimate (% or kWh, litre of fuel)	5,702 MWh
Estimate of reducing the emission (t CO_2)	2,714.15
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Eco fund
Short description/comment	Conditioning granting of subsidies for current buildings/enterprises in commercial and service sector by using renewable energy sources for generation of thermal energy. In accordance with previous experiences, estimated thermal energy savings will be 7% of total thermal energy consumption of this sb-sector in 2008 – 5,702 MWh. Before carrying out this measure it will be necessary to undertake a detailed analysis in order to identify the status, possibilities and method for its implementation.

Measures/activity	**17.** Installation of saving bulbs for commercial and service sector
Holder of activities	• The market law
Start/end of implementation (years)	2013 - 2017
Cost estimate (unit price or total as per the measure)	
Savings estimate (% or kWh, litre of fuel)	3,404 MWh electricity
Estimate of reducing the emission (t CO_2)	1,620.30

Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Own funds of the sector
Short description/comment	Pursuant to the EU Decree on lighting products (EC Regulation 244/2009) it is anticipated that production of classic light bulbs is going to be stopped by 2016 and all of the classic light bulbs are going to be replaced by the saving ones. In accordance with previous experiences, the estimated electricity savings are 8% of total electricity consumption for non-thermal purposes of this sub-sector in 2008 – 3,404 MWh. In accordance to the above, replacement of the classic light bulbs with saving bulbs will be mandatory for the entire commercial and service sector.

Measures/activity	**18.** Enforcement of the Decision on reducing the compensation for utility equipping for building and reconstruction of buildings in commercial and service sector that are using renewable energy sources.
Holder of activities	• The Capital City of Podgorica
Start/end of implementation (years)	2011 - 2020
Cost estimate (unit price or total as per the measure)	No initial investment costs
Savings estimate (% or kWh, litre of fuel)	2,443 MWh electricity
Estimate of reducing the emission (t CO_2)	1,162.87
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	
Short description/comment	Passing of the Decision of the City Assembly reducing the compensation for utility equipping for constructing and reconstructing the buildings in commecrial and service sector, that are using one or more renewable energy sources (for example: solar collectors, photo voltage panels, heat cranes, etc.) Before carrying out this measure, it will be necessary to undertake a detailed analysis in order to identify the status, possibilities and methods of implementation. It is assumed that implementation of this measure will reduce the thermal energy consumption of this sub-sector by 3% by 2020.

8.3. Measures for CO_2 emission reduction in the traffic sector of the Capital City of Podgorica

Measures for reduction of CO_2 emissions from the traffic sector of the Capital City of Podgorica are divided in 5 categories, as follows:

- Legislative and planning measures;
- Promotional, informative and educational measures and activities;
- Private and commercial vehicles;
- Vehicles owned and used by the Capital City;
- Public transport.

The category of legislative and planning measures implies measures and activities emanating from legal obligations and those pertaining to the planning of projects in terms of improving the traffic infrastructure, better regulation of traffic, increasing safety, etc.

Therefore, implementation of the planned measures will create the necessary prerequisites for improvement of the transport sector in the Capital City Podgorica. The public transport sector also includes the Capital City investments in modernization and adequate establishment of urban public transportation (purchase of modern buses using alternative fuels, introduction of other forms of organizing transport - trams, etc.). Accordingly, for implementation of capital investment cost measures it will be necessary to carry out extensive preparatory activities, implying preparation of feasibility studies and other analyzes without which it will not be possible to give estimates of necessary investments and other parameters. Also, most of the identified measures can only be described qualitatively, and it will be necessary to conduct additional research and analysis for each measure for quantitative results.

8.3.1. Legislative and planned measures

Number	**1**
Measure/activity	**Gradual development of the entire legislative, regulatory and institutional framework for energy efficiency based on the relevant EU directives and standards in the field of transport, and setting up mechanisms for their adequate enforcement and implementation**
Holder of activities	• State administration
Start/end of implementation (years)	2012 - 2020
Costs estimate (unit price or total as per the measure)	No investment costs
Savings estimate (% or kWh, litre of fuel)	After identifying indicative objectives in accordance with the EU legislative and standards, such as the share of 10% of biodiesel in total consumption in the traffic sector and so on, the conditions for estimate of savings will be created.
Estimate of reducing the emission (t CO_2)	
Costs as per the reduction of emission (€/t CO_2)	-
Source of funding	-
Short description/comment	Passing of the **Strategy of Energy Development by 2025** has set up the initial basis for the European model of sustainable and strategic development of energy sector, implying harmonization of national legislative in this area with the EU standards, and establishment of institutional support to successful enforcement of own energy policy. The set legal solutions will have to have energy, ecological, economic, organizational, institutional and educational dimension and give assumptions for defining individual objectives and activities to meet them. To that regard, the harmonized legal regulations will give specific commitments in the part concerning use of environmentally-friendly fuels (biodiesel, hydrogen, compressed natural gas (CNG) etc), generation of energy from renewable sources (hydro potential - building of small hydro power plants, energy of wind and the sun, use of biomass, plant residues and utility waste), including the financial incentive mechanisms. Although passing of these regulations is not the competence of local self-government, their successful enforcement will result in substantial reduction of CO_2 emissions within the transport sector of the Capital City by 2020.

Number	**2**
Measure/activity	**Introducing compensations for traffic pollution in the centre of the Capital City**
Holder of activities	• The Capital City of Podgorica • Secretariat for Spatial Planning and Environmental Protection • Secretariat for Utility Affairs and Traffic
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	€10,000 for preparation of the study on introducing compensations for traffic pollution € 5,000 for starting the implementation of measures (collected compensations will be used for financing future steps in carrying out this measure).
Savings estimate (% or kWh, litre of fuel)	Carrying out of the planned measure will not lead to fuel savings but will create the prerequisites for substantial reduction of pollution in the centre of the Capital City.
Estimate of reducing the emission (t CO_2)	

Costs as per the reduction of emission (€/t CO_2)	
Source of funding	• Budget of the Capital City • Credit funds • EU Funds
Short description/comment	Based on the experiences of other cities from the EU countries, it is proposed to consider the assumptions for introduction of charges for traffic pollution of the centre of the Capital City. The above measure would lead to decrease in the use of private vehicles and increase of the use of public transport. Funds collected from compensations for traffic pollution can be spent on improving the quality of public transport services. Also, part of the funds can be directed to the promotion in terms of popularizing more intensive use of public transport. Before implementing this measure it will be necessary to prepare a detailed study that needs to determine the vehicle categories that would be covered by this compensation, the amount of compensation for vehicles depending on the level of harmful emission, parts of the city, that is, zones covered by the collection of compensation for pollution. Also, the study should define the system of collecting compensations, as well as the control mechanisms for implementation of the measure.

Number	**3**
Measure/activity	**Relocating traffic from zone I by building a mini-bypass road**
Holder of activities	• The Capital City of Podgorica • Secretariat of Spatial Planning and Environmental Protection • Secretariat of Utility Affairs and Traffic
Start/end of implementation (years)	2008 - 2020
Cost estimate (unit price or total as per the measure)	cca €700.000 for drafting the document basis cca €26,600,000 for building of the mini bypass
Savings estimate (% or kWh, litre of fuel)	Carrying out of the planned measure will not lead to fuel savings but will create the prerequisites for substantial reduction of pollution in the centre of the Capital City.
Estimate of reducing the emission (t CO2)	
Costs as per the reduction of emission (€/t CO2)	
Source of funding	• Budget of the Capital City • credit • Investment and Development Fund of Montenegro • Eco Fund
Short description/comment	Results of individual parameters measured on sites next to the frequent communications in the city center indicate that growingly intense traffic in the city area is causing the ruining of the quality of environment and the necessity of resolving this problem is therefore imposed. To that regard, the Capital City has started activities on creating planning and investment preconditions for building of the mini-bypass, as the crucial communications that will greatly contribute to mitigation of this problem.

Number	**4**
Measure/activity	**Setting up occasional days/ sites without the vehicles, as well as certain streets or areas exclusively as pedestrian zones**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Traffic
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	No investment costs
Savings estimate (% or kWh, litre of fuel)	80.5 TJ diesel 19.2 TJ gasoline
Estimate of reducing the emission (t CO2)	7,295.3
Costs as per the reduction of emission (€/t CO2)	/
Source of funding	
Short description/comment	Introduction of the temporary measure of banning traffic on specific dates, in specific locations, especially regarding significant historical parts of the city, that is, establishment of pedestrian zones will result in reduction in use of private vehicles and reducing traffic in certain parts of the city, which assumes the reduction of CO_2 emissions, that is, of the pollution. Likewise, the above measure will contribute to raising citizens' awareness and

	serve for purposes of promotion and other measures of energy efficiency. The same as with the majority of measures, upon implementation of this particular measure it will be very difficult to assess the effects of actual fuel savings and related reduction of CO_2. However, by using the previous experiences in developed European countries, we can expect the results of the total energy savings in the traffic sector of the Capital City by 2.5%.

Number	**5**
Measure/activity	**Introducing information system for traffic supervision**
Holder of activities	• The Capital City of Podgorica • Secretariat for Utility Affairs and Transport
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	Capital City investment for which it will be necessary to prepare the investment study.
Savings estimate (% or kWh, litre of fuel)	161 TJ diesel 38.3 TJ gasoline
Estimate of reduction of emission (t CO2)	14,583.57
Costs as per the reduction of emission (€/t CO2)	/
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	The purpose of setting up the traffic signalling system – computer controlled systems, in certain areas/routes aiming at optimization of the traffic flow (for example: green waves) will be accomplished through reduction of emissions of greenhouse gases. It can be assumed the performance in the value is going to be 1-10%, however, this percentage will depend on whether we are accomplishing the effect of reducing crowds or reducing the fuel consumption. There are various traffic signaling systems, the cost advanced being so called "smart" adaptive systems. When speaking about this measure we should take into account that full benefits cannot be reached in "rush hour" periods when the traffic intensity is the highest. Possible short-term and mid-term impacts may be high, especially in cities where management and technical capacities are high. Likewise, introducing technology for detection/locating and forecasting incidents and initiating establishment of management in potential incident situations will lead to advancement of energy efficiency within the transport sector. Research results indicate that incidents make almost half of the delays on the road, which results in increasing the energy sources in the same amount, etc. For the needs of this Action Plan we can assume the savings of 5% of the total fuel used in the sub-sector of private and commercial vehicles by 2020.

Number	**6**
Measure/activity	**Setting up mechanism of faster flow and traffic circulation in the territory of the Capital City Podgorica**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Transport
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	It is no possible to estimate investment costs without an investment study.
Savings estimate (%or kWh, litre of fuel)	32.2 TJ diesel 8 TJ gasoline
Estimate of reducing the emission (t CO2)	2,940.54
Costs as per the reduction of emission (€/t CO2)	/
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	Application of specific transport infrastructure solutions (for example roundabouts) will contribute to speeding up the flow of traffic participants where we can count on the savings in consumption of energy sources and thus lower CO_2 emission. Likewise, creating assumptions for defining the traffic requirements in terms of special lines for public transportation vehicles and system solution for providing their priority on the crossroads will give appropriate effects.

	Traffic ban for trucks in communications in the centre of the city with high traffic frequency, especially at certain intervals when the traffic intensity is the highest was recognized as a very significant activity in implementation of the above measure. It can be assumed that implementation of this measure by 2020 will create the effect of reducing total fuel consumption in the sub-sector of private vehicles by 1%.

8.3.2. Promotional, informative and educational measures and activities

Number	**7**
Measure/activity	**Organizing an awareness raising campaign on reduction of negative impacts of vehicles (regularly maintained vehicles are more efficient, and emit less CO_2, insufficiently pumped tires increase the fuel consumption up to 4%, unnecessary use of air-conditioning increases fuel consumption and emission of CO_2 up to 5% …)**
Holder of activities	• The Capital City of Podgorica • Secretariat of Spatial Planning and Environment Protection • PR Service
Start/end of implementation (years)	2012 - 2020
Cost estimate(unit price or total as per the measure)	€ 10,000 annually, total € 80,000
Savings estimate (% or kWh, litre of fuel)	32.2 TJ diesel 8 TJ gasoline
Estimate of reducing the emission (t CO2)	2,940.54
Costs as per the reduction of emission (€/t CO2)	27.21
Source of funding	• Budget of the Capital City • Donors • EU Funds • Eco fund
Short description/comment	Numerous indicators point to the fact that insufficient attention is paid to the issue of increasing the efficiency of vehicles and thus impact the reduction of their negative environmental impact. There is a series of activities that vehicle owners should get familiar with and should be "taught" how to act and reduce the emission of the greenhouse gases and therefore contribute to the advancement of the environmental quality. Thus, removal of unnecessary items from the trunk or from the back seat will reduce the fuel consumption. Reduction of wind resistance by closing the windows, especially at higher speed, or by removing the luggage carrier from the roof, will decrease the fuel consumption and emission of CO_2 up to 10%. Any sudden speed increase will result in the engine using more fuel and releasing more CO_2, that is why we have to drive in reasonable speed and first of all moderately. The above measure belongs to the category of measures for which it is especially difficult to estimate the potential effects of fuel savings since its implementation to a large extent depends on the habits and awareness of the citizens themselves, on one side, and age and characteristics of vehicles, on other side. Considering the fact that given peculiarities differ from city to city and from state to state it will be impossible to make comparison and give a relevant estimate. Still, for the needs of this Action Plan, it can be assumed that implementation of this measure by 2020 will lead to the savings in total fuel consumption by 1% in the sub-sector of private vehicles.

Number	**8**
Measure/activity	**Implementing a media campaign for rational use of water, electricity, vehicles** (Campaign: One day a week without vehicles; It is healthier by bike!, Invitation to the joint vehicle use – "car sharing" model)
Holder of activities	• The Capital City of Podgorica • Secretarial for Spatial Planning and Environmental Protection • PR Service
Start/end of implementation (years)	2012 - 2020
Cost estimate(unit price or total as per the measure)	€ 10,000 annually, total € 80,000

Savings estimate(% or kWh, litre of fuel)	32.2 TJ diesel 8 TJ gasoline
Estimate of reducing the emission (t CO2)	2,940.54
Costs per reduction of the emission (€/t CO2)	27.21
Source of funding	• Budget of the Capital City • Donors • EU Funds • Eco fund
Short description/comment	Rational use of natural resources and stimulating citizens to save energy sources will have multiple benefits for environmental protection and contribute to the overall objectives of sustainable development. Experience has shown that organizing these campaigns has extraordinary effects and enables citizens to give their contribution in preserving and protecting the environment. For example, the Campaign one day a week without vehicles, stimulating drivers to leave their cars at home one day a week and in return get a cheaper city transportation ticket, discount for cultural and sports events, discount in stores etc. Also, an emphasis will be given to promoting possibilities of the "car sharing" model, which is becoming more and more popular in last decades in a number of European countries, though still not present here. Within this meaning, the citizens will have to be informed about advantages and possibilities this transport model is offering, from the aspect of higher mobility, simplification of movements and more economical use of vehicles. The same as the previous one, this measure will also depend on the habits and behaviour of citizens themselves. However, bearing in mind the huge strength of the media today, we can assume the effect of implementing this measure by 2020 will lead to reduction in fuel consumption in the sub-sector of private vehicles by 1%.

Number	**9**
Measure/activity	**Organization informational-demonstrational workshops for citizens about using vehicles on alternative fuels (electricity, gas, bio fuels, etc.) with possibility of renting vehicles using alternative fuels**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Traffic • PR service • Car dealers
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	€10,000 annually, total €80,000 for organization of workshops For building of the rent-a car centre it will be necessary to prepare the investment study. Thereat, it is important to have in mind that numerous experiences indicate the short-term return of the invested money through vehicles rental.
Savings estimate(% or kWh, litre of fuel)	32.2 TJ diesel 8 TJ gasoline
Estimate of reducing the emission (t CO2)	2,940.54
Costs as per the reduction of emission (€/t CO2)	27.21
Source of funding	Budget of the Capital City Donors EU Funds Eco fund
Short description/comment	Application of a wide spectrum of activities such as media campaigns, preparation of bulletins and brochures about the differences and method of operation of engines using alternative fuels to a large extent helps in reaching the appropriate results in raising awareness and level of citizens' information. In order to have higher effects of this campaign and involve a wider circle of stakeholders the demonstration of the engine model should be organized, as well as several completely new functional models, enabling test driving. As additional offer, a rent-a-car centre could be made at a later stage, for renting solely vehicles using alternative fuels. Experiences show that, if the media campaign is well designed and continuously implemented, the results of this measure will be possible to present in the level of 1% of the total fuel consumption in the sub-sector of private vehicles.

Number	**10**
Measure/activity	**Promotion of alternative transportation modes: walking, by bicycle or public transport - Campaign: Say YES to public transportation**
Holder of activities	• The Capital City of Podgorica • Secretariat of Spatial Planning and Environmental Protection • Secretariat of Utility Affairs and Transport • PR service
Start/end of implementation (years)	2012 - 2020
Cost estimate (unit price or total as per the measure)	€10,000 annually, total €80,000
Savings estimate (% or kWh, litre of fuel)	32.2 TJ diesel 8 TJ gasoline
Estimate of reducing the emission (t CO2)	2.940.54
Costs as per the reduction of emission (€/t CO2)	27.21
Source of funding	• **Budget of the Capital City** • **Donors** • **EU Funds** • **Eco fund**
Short description/comment	It is familiar that transport sector participates in the final energy consumption with approximately 10%**.** Almost 90% of energy consumption in transport falls to the road traffic, with dominant share of passengers vehicles**.** Today, in the developed countries, aiming at reducing CO_2 emission, a huge attention is paid to the measures directed at discouraging the individual motorized traffic. Most of the activities are based on reduction of using the passenger vehicles and conversion to the more "favourable" transport mode: walking, using bicycles or public transport. It can be assumed that this measure will result in reduction of the total fuel consumption in the sub-sector of private vehicles by 1%.

Number	**11**
Measure/activity	**Promotion of the use of alternative fuels**
Holder of activities	• The Capital City of Podgorica • Secretariat of Spatial Planning and Environmental Protection • Secretariat of Utility Affairs and Transport • PR service •
Start/end of implementation (years)	2012 - 2020
Costs estimate (unit price or total as per the measure)	***/***
Savings estimate (% or kWh, litre of fuel)	Fuel consumption will remain the same, but more ecologically acceptable fuels will be used, which will have a positive impact on quality of individual environmental segments.
Estimate of reducing the emission (t CO2)	21 t
Costs as per the reduction of emission (€/t CO2)	***/***
Source of funding	
Short description/comment	**Introduction of alternative fuels as substitution to the current fossil fuels** refers to the transfer of new technologies of car industry and introduction of ecologically acceptable alternative fuels as substitution to current liquid fuels. Introduction of alternative fuels (biodiesel, hydrogen, compressed natural gas (CNG), etc.), as a substitute for the current fossil fuels, as well as of hybrid and electrical vehicles, especially for those entities that have a mobility need – taxi services, car schools, delivery services, vehicles of state and local administration authorities, etc. Previous experiences indicate that in addition to implementation of all of the above described promotional and informational measures and the continuous media campaign, the successful implementation of this measure will also need

	subsidizing of either the purchase of new vehicles using alternative fuels, or adjusting of the existing drives to the new ones (for example: by CNG). According to the above said, for implementation of this measure it will be necessary to anticipate defining of appropriate legislative provisions that will precise the criteria, methods and means of subsidizing. After the successful implementation, by 2020 we can count on the reduction of emissions by 6%, which is 21 t CO_2.

8.3.3. Vehicles owned by the Capital City of Podgorica

Number	**12**
Measure/activity	**Introducing Green Public Procurement for procurement of new vehicles for the needs of the services of the Capital City**
Holder of activities	• The Capital City of Podgorica • General Service • Authorized officer for public procurement
Start/end of implementation (years)	2012 – 2020
Cost estimate (unit price or total as per the measure)	€ 10,000 for preparation of implementation and preparation of the Study of the fleet status assessment
Savings estimate (% or kWh, litre of fuel)	Fuel consumption will remain at the same level, but the used fuel will be more ecologically acceptable from the point of view of environmental protection, in terms of reducing the emission of greenhouse gases.
Estimate of reducing the emission (t CO_2)	480, 2 t
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City
Short description/comment	The first step in implementation of this measure implies observance and creation of prerequisites for making the Decision on criteria of the green public procurement for the needs of administrative authorities and enterprises in the Capital City, in accordance with the applicable legal regulations. The Green Public Procurement for all of the vehicles owned by the Capital City would specify the procurement of exclusively vehicles of small emission of CO_2 (< 120 g/km), that is, vehicles using alternative energy for their operation. Preparation of the Study would identify the current status of the fleet owned by the Capital City Podgorica, provide an estimate in terms of the size and level of CO_2 emission, that is, the need for supplying new vehicles. The above Study will define the conditions and criteria that new vehicles would have to meet, and accordingly the Regulation on the Green procurement of vehicles will be prepared. The green public procurement will result in supplying the vehicles of appropriate size and type for individual purposes, that is, enforcement of the rules of Positive Discrimination when selecting vehicles with small emission of CO_2 or vehicles using alternative fuels for their operation. With realistic assumption that by 2020 all 340 vehicles owned by the Capital City will be replaced by vehicles with reduced emission of greenhouse gases, the total emission of this sub-sector, amounting 1921 t CO_2 for 2008 will be reduced by 25%.

Number	**13**
Measure/activity	**Joint use of vehicles ("car sharing") for officers of the same company, that is, administrative authority of the Capital City**
Holder of activities	• The Capital City of Podgorica • City administration • Public enterprises
Start/end of implementation (years)	2012 – 2020.
Cost estimate (unit price or total as per the measure)	If we use the current fleet owned by the Capital City there will be no investment costs, while for the procurement of 10 new vehicles that would use the CNG as fuel, we would need the investment of cca €120,000.
Savings estimate (% or kWh, litre of fuel)	3.2 TJ diesel 0.8 TJ gasoline
Estimate of reducing emission (t CO_2)	292.57
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Credit funds

	• EU Funds
Short description/comment	"Car sharing" model for officers of the same company or administrative authority of the Capital City means that employees living in the same part of the city come to work by one joint vehicle, which would rationalize use of vehicles and thus decrease the emission of CO_2. There are also indirect impacts of this measure through reduction of a number of vehicles on the roads and therefore reduction of traffic jams, that is, the positive effect on the standstill traffic. The measure itself does not require any costs because we use the existing vehicles for its application, but a base of beneficiaries should be created, that is, the base of officers of individual companies and administrative authorities, as well as the system of fleet management in order to make the distribution of vehicles as per the number of beneficiaries. It this appears to be rational and relevant then recommendation is to procure vehicles using CNG: Implementation of this measure will actually lead to the fuel consumption of vehicles owned by the Capital City, but will reduce consumption of fuel of private vehicles of officers and increase a number of passengers in the vehicle. Besides, a clear message will be sent to the citizens that their city administration is using their own example to implement the energy savings measure and reducing CO_2 emission. The estimate is that by 2020 the savings will be 0.1% of total fuel consumption in the sector of private and commercial vehicles.

Number	**14**
Measure/activity	**Introducing system of sustainable management of the fleet owned by the Capital City - increasing energy efficiency of the fleet**
Holder of activities	• The Capital City of Podgorica • General Service
Start/end of implementation (years)	2012 – 2020
Cost estimate (unit price or total as per the measure)	€20,000 for preparation of the Study on identifying status and proposal of necessary measures for introducing system of management, as well as estimate of the necessary costs
Savings estimate (% or kWh, litre of fuel)	3.9 TJ diesel 1.4 TJ gasoline
Estimate of reducing the emission (t CO_2)	386.36
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget Of the Capital City • Credit funds
Short description/comment	Increase of the energy efficiency of the fleet will affect the reduction of average specific consumption (lit/100 km), and therefore the reduction of GHG emissions. This measure will include renewal of the fleet by more energy efficient vehicles, more strict mandatory periodic controls of exhaust emissions of vehicles, more efficient maintenance of vehicles and application of technical measures for reducing the vehicle fuel consumption. This measure will also include arrangement of the fuel quality control system and introduction of EU standards in this area. By systematic implementation of this measure, by 2020 we can expect reduction in fuel consumption in the sub-sector of vehicles owned by the Capital City by 20%.

8.3.4. Public transport

Number	**15**
Measure/activity	**Establishing and modernization of the public city transport**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Transport
Start/end of implementation (years)	2012 – 2020
Estimate of costs(unit price or total as per the measure)	cca €150,000 for preparation of the Study of long-term development of the public city transport and suburban transport in Podgorica cca from €1 mil. to €6 mil. subject to the applied scenario in resolving this issue
Savings estimate (% or kWh, litre of fuel)	Preparation of the Study will not directly affect the fuel savings, but will be the prerequisite for development and organization of public city transport of the Capital City in a more energy and ecologically sustainable manner.
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City

	• Credit funds • EU funds
Short description/comment	The basic purpose of this Study will be establishment of clear policy and objectives of sustainable traffic, supported by good organization of the system and reaching high standards in public transport of passengers. Such a standard will imply competitiveness of city transport with road motor transport with respect to the use of private vehicles, through increased availability by introduction of new lines and stops and appropriate frequency on these lines. Estimates that were undertaken in the domain of the city transport have indicated the possibility of a very significant energy saving, and that by forcing the equal development of the public city transport network will lead to a substantial reduction of unnecessary transport and will also stimulate use of these modes of public city transport with lowest oscillations and the highest scope of use of capacities and are therefore the most economical energy consumers. A special efficiency will be obtained by using buses on bio diesel or any other type of alternative fuel.

Number measures	**16**
measures/activity	**A set of measures for improving the quality of bus public transport in the territory of the Capital City of Podgorica**
Holder of activities	• The Capital City of Podgorica • Secretariat for Utility Affairs and Transport
Start/end of implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	It will be necessary to prepare an investment study for each individual measure
Savings estimate (% or kWh, litre of fuel)	Gasoline – 74 TJ Diesel – 291 TJ LPG – 22 TJ Total – 387 TJ
Estimate of reducing the emission (t CO_2)	28,235.49
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	Improvement of the bus public transport quality in the area of the Capital City will imply arrangement of the bus stands and eaves and installation of LED displays for presentation of bus arrivals in all of the bus stands; replacement of standard buses by mini buses in evening hours and on the lines with expected smaller number of passengers Implementation of the measure for improving the quality of bus public transport in the Capital City will not directly affect the reduction of emissions of CO_2, but that impact will be indirect through reduced use of private vehicles. It is assumed that after improvement of public city transport cca 20% of citizens will use their private cars less and thus reduce the annual consumption by cca 10%. Total consumption of private vehicles in 2008 amounted to 3,870 TJ, and expected savings are 387 TJ.

Number	**17**
Measure/activity	**Considering possibilities of introducing tram public transport**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Transport
Start/end of implementation (years)	2012 – 2020
Estimate of costs (unit price or total as per the measure)	€40,000 for preparation of the Feasibility Study on introduction of tram transport in the territory of the Capital City of Podgorica
Savings estimate (% or kWh, litre of fuel)	Preparation of the Study will not directly affect the fuel savings and reduction of related emissions, but will be the prerequisite for introduction of tram transport which will substantially reduce private vehicles use, resulting in reduction of pollution in the Capital City.
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	Urban environment has its legalities affecting the development possibilities of traffic infrastructure, imposing the need of finding the adequate solutions such as improving the utilization of existing capacities by new possibilities. Accordingly, it will be necessary to review the possibility of introducing trams as acceptable and, according to numerous indicators, successful part of the public transport system. Advantages of such a transport mode could be

	recognized through reduction of pollutant emissions, lower noise levels, adequate capacities for passenger transport and easier manipulation due to a smaller spatial occupancy of the street spaces. Likewise, the maintenance request will be much lower in relation to the buses.

Number	**18**
Measure/activity	**Stimulating production of bio diesel from edible waste oil for the public bus transport needs**
Holder of activities	• The Capital City of
Start/end of implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	€30 000 for preparing the feasibility Study
Savings estimate (% or kWh, litre of fuel)	52,000 litre of produced bio diesel
Estimate of reducing the emission (t CO_2)	127.13
Costs as per the reduction of emission (€/t CO_2)	-
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	Production of bio diesel from waste edible oil is relatively easily applicable project. The first step will be the preparation of the Study on identifying potentials for collecting edible waste oil in the territory of the city. This should be emphasized, that even in the case the estimated quantities are not significant (which is realistic to expect), we should bear in mind that benefits from implementation of such project will be multiple since production of fuel is not the only objective, but also prevention of pouring out of edible waste oil into the sewage system. Further, this measure will also have its social aspect pertaining to the opening of new jobs, and also ecological segment through impact on changing the citizens' relationship to the waste and secondary raw materials. The basic role of the city within this measure will consist in providing support to entrepreneurs' initiatives in the part related to collecting edible waste oil and possibly in selecting and securing the site of the plant for bio diesel production. Estimated savings will depend on the quantity of produced bio diesel which, according to the experience, will be 1l/ household which, for 52 093 households and according to the statistical data, will give cca 52,000 litres of produced bio diesel, that is, of saved fossil fuel.

Number	**19**
Measure/activity	**Mandatory application of the Green Public Procurement standards with regard to the organizing of public transport**
Holder of activities	The Capital City of Podgorica Authorized officer for public procurement
Start/end of implementation (years)	2012- 2020
Estimate of costs (unit price or total as per the measure)	No costs
Savings estimate (% or kWh, litre of fuel)	Procurement of public transport buses using alternative drive fuel will contribute to reduction of the pollution of environmental segments in the Capital City
Estimate of reducing the emission (t CO_2)	
Costs as per the reduction of emission (€/t CO_2)	
Source of funding	• **Budget of the Capital City**
Short description/comment	The green public procurement for all vehicles of public transport should prescribe that procurement of the entire fleet, or at least its largest part, refers to the vehicles with small emission of CO_2. The basic potential of EE measure in rational consumption of energy sources in the domain of the road traffic will be implemented through stimulation and affirmation of procurement of vehicles using alternative fuels for their operation. Additional reasons to have the transport sector involved in EE programs is the facts that they are mainly imported energy sources and that emission of harmful gases increase environmental pollution in urban entities. Also, not less important, is the fact that there are a number of entities whose activities or carrying them out imply huge need for mobility, which makes the substitution of the existing fossil fuels by alternative ones a relevant method for reaching satisfactory effects. Implementation of this measure will create assumptions for future accomplishment of objectives of reducing emissions of CO_2.

Number	20
Measure/activity	**Expanding the public city transport network by introducing new bus lines and extending the current ones**
Holder of activities	• The Capital City of Podgorica • Authorized officer for public procurement
Start/end of implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	Capital City investment requiring preparation of the detailed investment studies
Savings estimate (% or kWh, litre of fuel)	Gasoline – 37 TJ Diesel – 145 TJ LPG – 11 TJ Total – 193 TJ
Estimate of reducing the emission (t CO_2)	14,080.79
Costs as per the reduction of emission (€/t CO_2)	-
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	By development and advancement of the public transport network it will become more available to a wider circle of beneficiaries and may directly affect the change in the selection of transport means in favour of the public transport. This measure will not have a higher significance in reaching the effects of fuel savings because due to the enlargement of the city and suburban transport lines it can actually come to a counter effect in terms of substantial fuel increase in public transport. Savings effects could be visible in the sector of private and commercial vehicles through the reduced dynamics of their use. Along with the established network of bus lines that is going to cover the entire Capital City, we can expect the saving of 5% in the sub-sector of private and commercial vehicles, by 2020.

Number	21
Measure/activity	**A set of measures for improvement of the quality of the railway transport in the Capital City of Podgorica**
Holder of activities	• The Capital City • Railway infrastructure of Montenegro Shareholding company Podgorica • Railway transport of Montenegro Shareholding company Podgorica
Start/end of the implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	It will be necessary to prepare the investment study for each individual measure.
Savings estimate (% or kWh, litre of fuel)	Gasoline – 74 TJ Diesel – 291 TJ LPG – 22 TJ Total – 387 TJ
Estimate of reducing the emission (t CO_2)	28,235.49
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • State budget • Credit funds
Short description/comment	Results of modern researches indicate numerous advantages of the railway transport compared to the other transport modes for passengers and goods. To that regard, it will be especially important to stress that, globally observed, only 3% of harmful substances originating from the traffic as a whole, refers to the railway transport, as well as the fact that on electrified tracks the primary energy sources are used in the best possible manner. Further, for the same scope of transport, the level of noise of the road transport is twice higher than the level of noise of the railway transport which, it is worth noting, is going on under any weather circumstances, without any delays as a rule, which is important from the aspect of the level of harmful matters emission. Bearing in mind the recognized suitability of this transport mode, a set of measures was defined to use the same in the best possible manner. Among other things, it is the redirecting of the cargo and passengers transport to the railway one, extending the system of city-suburban transport, as well as the modernization of the fleet through procurement of the new electric engine trains, which will achieve a substantial energy saving as well as the decrease of transport costs. Adjustment of the itinerary to realistic needs of the citizens, through higher

	frequency of train departures in the hours of people going to work would have indirect effects, through reduction in using private and commercial vehicles. The role of the Capital City might be recognized through subsidizing daily and monthly tickets to certain groups of citizens (pupils, students, retired people, etc.); Implementation of the set of measures for improving the railway transport in the city will not directly affect the reduction of emission of CO_2 but certain effects will be reached through reduced use of private vehicles. It is assumed that by improving the public railway transport cca 20% of citizens will use their private cars less and therefore reduce the annual fuel consumption by 10%. Total consumption of private vehicles in 2008 was 3873 TJ, and expected saving is 387 TJ.
Number	**22**
Measure/activity	**Setting up traffic of passengers' vehicles on the route Podgorica - Nikšić**
Holder of activities	• Railway infrastructure of Montenegro Podgorica • Railway transport of Montenegro Podgorica
Start/end of the implementation(years)	2010 - 2020
Estimate of costs(unit price or total as per the measure)	cca 15 million euro – Capital City investment requiring preparation of detailed investment studies.
Savings estimate (% or kWh, litre of fuel)	Savings by implementation of this measure have already been included by savings specified in the previous measure no. 21.
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• State budget • Credit funds
Short description/comment	Justification of the need for repeated setting up of the railway transport on route Podgorica-Nikšić primarily reflects in the fact that the said cities are situated at relatively small distance, whereat the passenger frequency between them is very large, due to the working and students duties. To that regard, enabling the trains being used as transport means, in highly frequent terms, will by all means contribute to substantially lower use of private vehicles and buses, resulting in smaller frequency of road transport, that is, a lower level of emissions of CO_2. The above measure implies reconstruction of the existing infrastructure and newly planned construction works on mentioned section, that is, reconstruction and electrification of the existing railway, up to its full functioning.

Number	**23**
Measure/activity	**A set of measures for improving the bicycle transport in the area of the Capital City**
Holder of activities	• The Capital City of Podgorica • Secretariat of Spatial Planning and Environmental protection • Secretariat of Utility Affairs and Transport
Start/end of implementation (years)	2012 - 2015
Estimate of costs (unit price or total as per the measure)	For costs estimate of this very complex measure it will be necessary to undertake additional analysis and prepare the feasibility study.
Savings estimate (% or kWh, litre of fuel)	Gasoline – 22 TJ Diesel – 87 TJ LPG – 7 TJ Total – 116 TJ
Estimate of reducing the emission (t CO_2)	8,462.49
Costs as per the reduction of emission (€/t CO_2)	-
Source of funding	• Budget of the Capital City • Credit funds • EU funds
Short description/comment	Bicycle transport, observed from many aspects, by all means represents a transport mode that should be especially stimulated and promoted in urban settlements. Aiming at more comprehensive utilization of its potentials it will be necessary to provide necessary conditions, primarily through implementation of adequate infrastructure. That implies building of new and continuous maintenance of cycling paths in the city area. As inevitable ancillary facilities, we would produce and place the billboards with maps of the marked cycling paths, as well as the garages in the rush sites of the city, equipped by video surveillance in order to prevent thefts. Within this set of measures, setting of the network of stations for renting bicycles was recognized as especially stimulating method, which would make users' movements much easier and enable their substantial mobility. These stations would be located in carefully selected sites, where it would be necessary to also protect bicycles from theft by IT protection. An important segment of the given set of measures will also be intense promotional activities directed to stimulating use of bicycle transport, as well as the planning solutions by which,

	wherever possible, cycling paths will be separated from the road, which is preventively affecting the reduction of a number of traffic accidents. According to the foreign experiences, implementation of this set of measures in the ten year period would indirectly reduce the fuel consumption of private and commercial vehicles by 3%, which is 116 TJ.

8.3.5. Private and commercial vehicles

Number	**24**
Measure/activity	**Setting up the system of paying the entry into the city centre for vehicles, based on the vehicle type and the number of passengers in them**
Holder of activities	• The Capital City of Podgorica • Secretariat of Utility Affairs and Transport
Start/end of implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	For cost estimate of this very complex measure it will be necessary to undertake additional analysis and prepare the feasibility study.
Savings estimate (% or kWh, litre of fuel)	Gasoline – 52 TJ Diesel – 204 TJ LPG – 15 TJ Total – 271 TJ
Estimate of reducing the emission (t CO_2)	19,773
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Credit funds
Short description/comment	One of the methods of reducing the number of vehicles in parts of the city characterized by highest traffic jams is the collection and tariffing vehicles using conventional fuels. The above measure would imply lower tariff for vehicles using alternative fuels or have 3 or more passengers in them. Expected result after enforcement of this measure will be that a larger number of vehicles circulating around the most polluted part of the city is using ecologically acceptable fuel, that is, pollute the environment as less as possible, and instead of 1.5 passengers per vehicle so far, that number will increase and thus reduce the number of vehicles. It is assumed that setting up of such a system will reduce fuel consumption by 2020 by cca 7%, which is 271 TJ.

Number	**25**
Measure/activity	**Introducing the system of automatic charging for parking in the Capital City**
Holder of activities	• The Capital City • PE parking and services
Start/end of implementation (years)	2012 - 2020
Estimate of costs(unit price or total as per the measure)	This is the measure for whose estimate of investment costs it will be necessary to undertake additional analysis and prepare the feasibility study
Savings estimate (% or kWh, litre of fuel)	Gasoline – 52 TJ Diesel– 204 TJ LPG – 15 TJ Total – 271 TJ
Estimate of reducing the emission (t CO_2)	19,773
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City • Credit funds
Short description/comment	Introducing the system of automatic collection of parking in the Capital City will significantly reduce the frequency of using vehicles, primarily in shorter distances. It is estimated that after implementation of this measure prior fuel consumption of private vehicles and related emissions will reduce by 3% by 2020. It is recommended the Capital City is divided into three parking zones with time limiting parking duration of 1, 2 or 3 hours.

8.4. Measures for CO_2 emission reduction in the public lighting sector of the Capital City of Podgorica

Number	**1**
Measures/activity	**Replacement of obsolete lights with energy more efficient and ecologically acceptable lights**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011 - 2020
Estimate of costs (unit price or total as per the measure)	250 €/ light Total for 2000 lights: € 500 000
Savings estimate (% or kWh, litre of fuel	92.75 kWh/ illuminating body Total: 185.5 MWh
Estimate of reducing the emission (t CO_2)	88.298
Costs as per the reduction of emission (€/t CO_2)	5,662.64
Source of funding	• Budget of the Capital City
Short description/comment	Activities that will be necessary to undertake include the gradual replacement of cca 2000 current obsolete lights with modern ones of the following characteristics: • energy efficient; • technology of optic make enables installation of light bulbs of smaller power, with keeping of the existing level of illumination; • contain electronic ballasts – possible regulation on each light.

Number	**2**
Measures/activity	**Replacement of current electrical magnetic ballasts in lights and installation of modern electronic ballasts**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011 - 2020
Estimate of costs (unit price or total as per the measure)	In combination with the previous one, this measure will not require additional investment
Savings estimate (% or kWh, litre of fuel)	2,606 MWh
Estimate of reducing emission (t CO_2)	1,240.456
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	/
Short description/comment	Combined with the previous one, this measure will not require additional financial assets from following reasons: • the investments comprised in this measure of replacing the obsolete lights (measure 1); • modern lights contain starting elements and electronic ballasts where on each individual light during the assembly we have to adjust the operating regimes, in accordance with the requirements for intensity of illumination of a certain public area; • reduction of energy consumption due to the reduced illumination intensity in night hours in illuminated areas of lower priority. Based on the implemented projects of reconstructing the public lighting in numerous European cities, estimated reduction of energy consumption by enforcement of this measure in the city of Podgorica would be 25% of consumption in 2008, or 2,606 MWh.

Number	**3**
Measures/activity	**Installation of astronomic real time clocks, switching on the public lighting at exact time, subject to the geographic position**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011 - 2020

Estimate of costs (unit price or total as per the measure)	75 €/ meter Total for 200 illuminating bodies: €15,000
Savings estimate (% or kWh, litre of fuel)	Around 25% in average for each meter, subject to the day of the year
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City
Short description/comment	Activities that are necessary to be implemented will include gradual replacement of cca 200 current and obsolete lights with astronomic real time clocks of the following characteristics: • switching lights on and off, depending on the day of the year and thus avoiding early switching on and/or late switching off of the lighting; • Simple installation and manipulation; • Unnecessary maintenance and occasional calibration, that is, switching from summer to winter regime of operation and vice versa.

Number	**4**
Measures/activity	**Building of the control centre for public lighting and traffic lights control as well as supplying and implementing the new software for systems of surveillance and management of public lighting and traffic lights**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011 - 2020
Estimate of costs (unit price or total as per the measure)	€ 20,000 – 50,000 for hardware and software for the needs of the control centre
Savings estimate (% or kWh, litre of fuel)	
Estimate of reducing the emission (t CO_2)	/
Costs as per the reduction of emission (€/t CO_2)	/
Source of funding	• Budget of the Capital City
Short description/comment	The control centre will enable monitoring and management of technical parameters of public lighting and light signalization, as well as automated signalization of irregular operation of the same, which achieves the following: • Reduction of needs of bypassing the public lighting and light signalization • Timely reacting in case of the malfunction on one of the mentioned systems • Possibility of remote control of the illumination intensity and regulating light signalization • Development of the own data base, which will additionally reduce maintenance costs This measure will not directly save electricity, but will reduce the maintenance costs by 10%

Number	**5**
Measures/activity	**Creating assumptions for getting the status of 10 kV consumers for category of consumption public lighting**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011- 2020
Estimate of costs (unit price or total as per the measure)	No costs
Savings estimate (% or kWh, litre of fuel)	
Estimate of reducing emission (t CO_2)	
Costs as per the reduction of emission (€/t CO_2)	
Source of funding	• Budget of the Capital City
Short description/comment	By changing the category of consumption from current one to “10 kV consumer” we will obtain

	a substantial saving due to a lower price of kWh for the category of "10 kV consumer". By implementing this measure we will not save the electricity, but we will by 30% reduce the bills for the consumed electricity for each meter that meets the requirements for changing the category of consumption.

Number	**6**
Measures/activity	**Reconstruction of old connections to the power distribution network, which will achieve a certain energy saving**
Holder of activities	• The Capital City of Podgorica • Concessionaires
Start/end of implementation (years)	2011 - 2020
Estimate of costs (unit price or total as per the measure)	Assuming that 300 connections are reconstructed the price will be €60,000.
Savings estimate (% or kWh, litre of fuel)	Expected savings cca 500 MWh
Estimate of reducing the emission (t CO_2)	238
Costs as per the reduction of emission (€/t CO_2)	252.10
Source of funding	• Budget of the Capital City
Short description/comment	Reconstruction of old connecting spots to the power distribution network implies the following: • Replacement of worn components • Adjustment of the consumption to the capacity of the connection, which will directly decrease losses • the level of failure is reduced, that is, reliability of the system increases • Eliminating potential illegal electricity consumption that is recorded on electrical meters for the needs of the public lighting and traffic lights;

9. Assessment of CO_2 emissions reduction and identified measures by 2020

9.1 Initial considerations

For the needs of estimating the reduction of CO_2 emissions by 2020 for the identified measures of energy efficiency in sectors of building, transport and public lighting in the Capital City of Podgorica that have been presented in the previous Chapter we have prepared the projections of energy consumption and emissions movements by 2020 for two scenarios: *scenario without measures and scenario with measures*.

Scenario without measures is the basic scenario implying the increase of energy consumption, subject to the market movements and consumers' habits, without systematic implementation of energy efficiency measures, with the assumption of ordinary application of new, technologically more advanced products appearing in the market in time.

Scenario with measures implies reduction of energy consumption and related CO_2 emissions by 2020 by implementing identified measures of energy efficiency in sectors of building, transport and public lighting.

9.2. CO_2 emissions projections in the transport sector

Scenario without measures for the transport sector will be based on the assumption that a number of inhabitants per private vehicle will reach the level of 2.1 by 2020,

which is the average level in 2008 for the European Union countries, while the same level in 2020 will be 2.0 inhabitant/vehicle.

In the Capital City of Podgorica, in 2008, the number of inhabitants per private vehicle was 2.9 inhabitants.

Considering the share of private vehicles in 2008 and the population growth projections in the Capital City by 2020, the total number of passengers' vehicles (Table 9.1) was estimated at 94,188.

Table 9.1 Estimation of number of vehicles

	Number of vehicles in 2008	Share of individual type of vehicle in 2008 (%)	Projection of vehicles in 2020
Private vehicles	61,558	89.08	83,903
Cargo and work vehicles	6,145	8.89	8,376
Mopeds and motorcycles	1,146	1.66	1,562
Buses	255	0.37	348
Total number of vehicles	**69,104**	**100.00**	**94,188**

A detailed distribution of the fleet of private vehicles, cargo vehicles, buses and motorcycles needed for COPERT model is built into the assumption that share of individual types of vehicles in the fleet will be the same as the share of that type of vehicle in Montenegro in 2008. To support the above, it was taken into account that other assumed parameters that are necessary (distance covered, speed as per categories, temperature…) for estimate are constant, that is, equal to the parameters used in estimating the emissions for 2008.

COPERT model calculated the fuel consumption and CO_2 emissions for certain types of vehicles for the scenario without the measure (Table 9.2). Projection of emissions of the fleet owned by the Capital City was estimated with the assumption that share of emissions of the respective sub-sector will be the same as the share from 2008.

Table 9.2 Projection of energy consumption and CO_2 emission for 2020 for the scenario without measures (BAU scenario)

Projections of transport sector Scenario without measures	Energy consumption		Emission
	TJ	MWh	t CO_2
Private and commercial vehicles			
Petrol	882.58	245,159.80	61,850.90
Diesel	3,406.55	946,263.50	251,778.00
UNP	319.73	88,814.90	18,221.60
TOTAL	4,608.86	1,280,238.20	331,850.50
Vehicles owned by the Capital City			
Petrol	7.99	2,218.30	559.66
Diesel	23.35	6,485.50	1,725.64
UNP	0.23	65.00	14.65
TOTAL	31.57	8,768.80	2,299.95
Public city transport			
Diesel	164.04	45,566,70	12,124.20
Electricity	65.10	18,084,00	8,608.00
TOTAL	229.14	63,650,70	20,732.20
TOTAL TRANSPORT SECTOR	**4,869.57**	**1,352,657,70**	**354,882.65**

Scenario with measures is based on the estimate of the reduced energy consumption of the transport sector in 2020, according to the measures given in the previous chapter. Measures are divided as per the sub-sectors and savings calculated for each measure as well as the potentials of reducing the emissions of CO_2 (Table 9.3). Figure 9.1 presents the contribution of the potential of reducing the emissions in each sub-sector to the total potential of transport sector.

Table 9.3 Savings and potentials of reducing CO_2 emissions in the transport sector for individual measures

MEASURES AND POTENTIALS OF REDUCING THE TRANSPORT SECTOR	savings			reduction of emissions		
	gasoline TJ	diesel TJ	UNP TJ	gasoline t CO_2	diesel t CO_2	UNP t CO_2
Legislative and planning measures						
Setting up occasional days /sites without cars, and also certain streets or areas as exceptional pedestrian zones	19.20	80.50	0.00	1,345.54	5,949.76	0.00
Introducing information system for transport control	38.30	161.00	0.00	2,684.06	11,899.51	0.00
Setting up mechanisms of faster flow and circulation of traffic in the area of the Capital City of Podgorica	8.00	32.20	0.00	560.64	2,379.90	0.00
TOTAL	65.50	273.70	0.00	4,590.24	20,229.17	0.00
Promotional and educational activities, national legislation						
Organizing the awareness raising campaign on reducing the negative impact of vehicles	8.00	32.20	0.00	560.64	2,379.90	0.00
Implementation of Campaign in the media for rational use of water, electricity, cars	8.00	32.20	0.00	560.64	2,379.90	0.00
Organization of informational-demonstration workshops for citizens about using vehicles on alternative fuels	8.00	32.20	0.00	560.64	2,379.90	0.00
Promotion of alternative transport modes	8.00	32.20	0.00	560.64	2,379.90	0.00
Promotion of using alternative fuels	0.00	0.00	0.00	0.00	21.00	0.00
TOTAL	32.00	128.80	0.00	2,242.56	9,540.61	0.00
Vehicles owned by the Capital City						

Introducing the green public procurement for supplying new vehicles for the needs of the Capital City's services	0.00	0.00	0.00	0.00	480.20	0.00
Joint use of vehicles ("car sharing") for officers of the same company	0.80	3.20	0.00	56.06	236.51	0.00
Introducing system of sustainable management of the fleet owned by the Capital City	1.40	3.90	0.00	98.11	288.25	0.00
TOTAL	2.20	7.10	0.00	154.18	1,004.96	0.00
Private and commercial vehicles						
Setting up the collection system for entry into the city centre by vehicles, based on the type of vehicle and number of passengers in it	52.00	204.00	15.00	3,644.16	15,077.64	1,051.20
Introducing system of automatic collection for parking in the Capital City	52.00	204.00	15.00	3,644.16	15,077.64	1,051.20
TOTAL	104.00	408.00	30.00	7,288.32	30,155.28	2,102.40
Public transport						
A set of measures for improving the quality of public bus transport in the area of the Capital City of Podgorica	74.00	291.00	22.00	5,185.92	21,507.81	1,541.76
Stimulating production of bio diesel from edible waste oil for the needs of public bus transport	0.00	1.72	0.00	0.00	127.13	0.00
Enlargement of the public city transport network by introducing new bus lines and expanding the current ones	37.00	145.00	11.00	2,592.96	10,716.95	770.88
A set of measures for improving the quality of railway transport of the Capital City of Podgorica	74.00	291.00	22.00	5,185.92	21,507.81	1,541.76
A group of measures for improving the bicycle transport in the area of the Capital City of Podgorica	22.00	87.00	7.00	1,541.76	6,430.17	490.56
TOTAL	207.00	815.72	62.00	14,506.56	60,289.87	4,344.96
TOTAL TRANSPORT SECTOR	**410.70**	**1 633.32**	**92.00**	**28,781.86**	**121,219.88**	**6,447.36**
	2,136.02			**156,449.10**		

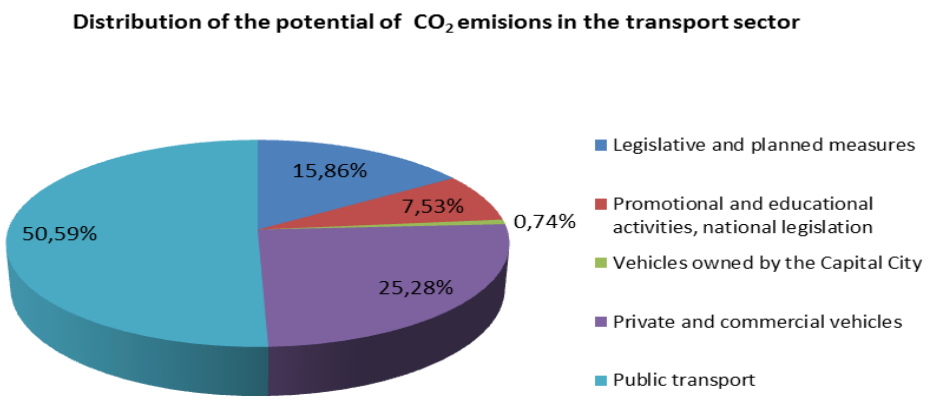

Figure 9.1 Distribution of the potential for CO_2 emission reduction in the transport sector

Total potential for CO_2 emission reduction in the transport sector is 156,449.10 t CO_2. Legislative and planning measures, as well as the promotional, informational and educational measures, largely refer to the sub-sector of private and commercial vehicles, so that their share will be calculated into the sub-sector of private and commercial vehicles. Therefore, the sub-sector of private and commercial vehicles will contribute to the total potential with 48.67%, which is 76,148.58 t CO_2, public transport will contribute with 50.59% which in t CO_2 is 79,141.39, while the rest of 1 159.14 t CO_2 will belong to the sector of vehicles owned by the Capital City.

Scenario with measures was prepared in the manner taking into account the measures presented in Table 9.3, whereat the emission of the scenario with measures was calculated as the difference of the emissions from scenario without the measure and the potential of reduction. The Table 9.4 provides energy consumptions as well as the emissions of CO_2, of the scenario with measures for transport sector.

Table 9.4 Projection of energy consumption and emissions for 2020 for scenario with measures

Projections of transport sector Scenario with measures	Energy consumption	Emission
	TJ	t CO_2
Private and commercial vehicles		
Petrol	474.08	33,223.22
Diesel	1,780.33	131,563.08
UNP	227.73	9,671.84

TOTAL	2,482.14	174,458.14
Vehicles owned by the Capital City		
Petrol	5.79	405.48
Diesel	16.25	720.68
UNP	0.23	14.65
TOTAL	22.27	1,140.81
Public city transport		
Diesel	164.04	12,124.20
Electricity	65.10	8,608.00
TOTAL	229.14	20,732.20
TOTAL TRANSPORT SECTOR	**2,733.55**	**196,331.15**

After comparing the scenario without the measure and scenario with measures, it can be concluded that the emission of CO_2, of the scenario with measures 44.68% less. After comparing the emission of CO_2 of the scenario with measures with the emission of CO_2 from 2008 it comes out that the same is 34.27% less. Total CO_2 emissions and energy consumption of both scenarios, as well as the comparison with emission from 2008 are shown in the Table 9.5 and Figure 9.2.

Table 9.5 Projections of the transport sector as per the scenarios

Scenario	Energy consumption, TJ		% compared to 2008	Emission of t CO_2		% compared to 2008
	2008	2020		2008	2020	
Scenario without measures (BAU scenario - Business as usual)	4,076.00	4,869.58	19.47	298,672	354 883	18.82
Scenario with measures	4,076.00	2,733.55	-32.94	298,672	196,331.15	-34.27

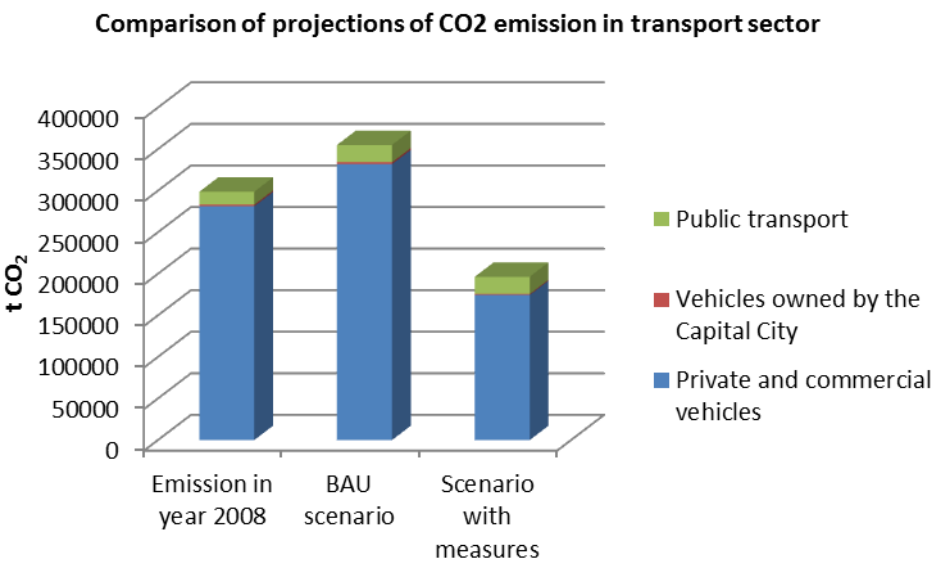

Figure 9.2 Comparison of projections of CO_2 emission for BAU scenario and scenario with measures as well as with emissions in 2008 for transport sector

9.3. CO_2 emissions projections in the buildings sector

Based on the known consumption of energy sources in 2008 and the expected growth of consumption by 2020 the scenario without the measures was prepared for the building sector. In accordance with the effective Strategy of Energy Development the Tables 9.6 and 9.7 show the projections of energy sources consumption, as well as the related emission.

Table 9.6 Consumption of energy sources for the scenario without measures for building sector

CATEGORY	Energy consumption (MWh), 2020			
	Electricity	Natural gas	Heating oil	Biomass
BUILDINGS OWNED BY THE CAPITAL CITY				
CITY ADMINISTRATION	2,031.40	0.00	0	0
LOCAL SELF-GOVERNANCE	209.30	0.00	0	0
CULTURE	582.80	11.60	110.3	169.1
APARTMENTS	3,622.20	0.00	0	0
ENTERPRISES	2,521.90	0.00	367.5	24.2

COMPANIES	1,755.50	0.00	0	0
OTHER	286.40	0.00	0	0
TOTAL:	11,009.50	11.60	477.80	193.30
BUILDINGS OF COMMERCIAL AND SERVICE ACTIVITIES				
BUILDINGS OF COMMERCIAL AND SERVICE ACTIVITIES	136,409	0	0	0
RESIDENTIAL BUILDINGS - HOUSEHOLDS				
HOUSEHOLDS	465,005	0	0	58,212.5
TOTAL	**612,423.50**	**11.60**	**477.80**	**58,405.80**

Table 9.7 Projection of CO_2 emissions for scenario without the measure in the building sector

CATEGORY	Emission t CO2, 2020			
	Electricity	Natural gas	Heating oil	Biomass
BUILDINGS OWNED BY THE CAPITAL CITY				
CITY ADMINISTRATION	966.90	0.00	0	0
LOCAL SELF-GOVERNANCE	99.60	0.00	0	0
CULTURE	277.40	2.40	31.05	0
APARTMENTS	1,724.20	0.00	0	0
ENTERPRISES	1,200.40	0.00	103.5	0
COMPANIES	835.60	0.00	0	0
OTHER	136.30	0.00	0	0
TOTAL:	5,240.40	2.40	134.55	0.00
BUILDINGS OF COMMERCIAL AND SERVICE ACTIVITIES				

BUILDINGS OF COMMERCIAL AND SERVICE ACTIVITIES	64,930.9	0	0	0
RESIDENTIAL BUILDINGS-HOUSEHOLDS				
HOUSEHOLDS	221,342.3	0	0	0
TOTAL	**291,513.60**	**2.40**	**134.55**	**0.00**

In order to develop the scenario with measures it was necessary to determine energy savings that might be achieved by 2020 by implementing measures given in the previous chapter. Measures are divided according to the sub-sectors and for each measure we have calculated the savings and potentials of reducing the CO_2 emissions (Tables 9.8 and 9.9). The Figure 9.3 shows contribution of the potential of reducing the CO_2 emissions of each sub-sector to the total potential in the building sector.

Table 9.8 Savings with respect to the BAU scenario of the building sector

Sub-sector	Measure	Estimate of savings MWh	
		Electricity	Total saving
BUILDINGS OWNED BY THE CAPITAL CITY	Education and changing the behaviour of employees/ beneficiaries of the buildings owned by the Capital City of Podgorica	1,670	1,670
	Setting up solar collectors for preparation of the hot water on residential buildings owned by the Capital City	74.12	74.12
	Modernization of lighting in 100 offices in administrative buildings owned by the Capital City of Podgorica	8.65	8.65
	Placing thermometers in each of the premises in buildings owned by the Capital City of Podgorica	284	284
	Thermal insulation of external cladding and the roof for 10 buildings owned by the Capital City of Podgorica	480	480
	Installation of energy highly efficient windows in 10 buildings owned by the Capital City of Podgorica	210	210
	Introducing criteria of the Green public procurement for purchase of electrical devices for buildings owned by the Capital City of Podgorica	283	283
	Introduction of saving lamps into the buildings owned by the Capital City of Podgorica	282	282
	Adaptation of the former building of PE Water Supply and Sewage Management, in Vuka Karadzica street	550	550
	TOTAL	**3,841.77**	**3,841.77**

RESIDENTIAL SECTOR	Citizens' education and promotion of energy efficiency	42,661	42,661
	Installation of solar systems in 400 households of the Capital City Podgorica	1,615.2	1,615.2
	Introduction of saving lamps in all of the households of the Capital City	26,044	26,044
	Thermal insulation of the exterior cladding – façade of the collective residential facilities by system of funding 50%-50%	1,440	1,440
	TOTAL	**71,760.2**	**71,760.2**
COMMERCIAL AND SERVICE SECTOR	Making of the city assembly's decision on reducing the compensation for utility equipping for building of facilities of designed energy consumption of up to 45/15 kWh/m^2 a year (according to the low energy, that is, passive standard)	4,887	4,887
	Conditioning incentives by using renewable energy sources for generation of heat	5,702	5,702
	Installation of saving lamps for commercial and service sector	3,404	3,404
	Making of the city assembly's decision on reducing the compensation for utility equipping and reconstruction of buildings in commercial and service sector that are using renewable energy sources.	2,443	2,443
	TOTAL	**16,436**	**16,436**
TOTAL FOR BUILDING SECTOR		**92,037.97**	**92,037.97**

Table 9.9 Potentials of reducing the CO_2 emission in building sector

Sub-sector	Measure	Reduction of emission (t)	
		Electricity	Total reduction
BUILDINGS OWNED BY THE CITY	Education and changing the behaviour of employees/ beneficiaries of the buildings owned by the Capital City of Podgorica	794.92	794.92
	Setting up solar collectors for preparation of the hot water on residential buildings owned by the Capital City	35.28	35.28
	Modernization of illumination in 100 offices in administrative buildings owned by the Capital City of Podgorica	4.12	4.12
	Placing thermometers in each of the premises in buildings owned by the Capital City of Podgorica	135.18	135.18
	Thermal insulation of external cladding and the roof for 10 buildings owned by the Capital City of Podgorica	228.48	228.48
	Installation of energy highly efficient windows in 10 buildings owned by the Capital City of Podgorica	99.96	99.96
	Introducing criteria of the Green public procurement for purchase of electrical devices for buildings owned by the Capital City of Podgorica	134.71	134.71
	Introduction of saving lamps into the buildings owned by the Capital City of Podgorica	134.23	134.23
	Adaptation of the former building of PE Water Supply and Sewage Management, in Vuka Karadzica street	261.80	261.80

	TOTAL	**1,828.68**	**1,828.68**
RESIDENTIAL SECTOR	Education and promotion of energy efficiency for citizens	20,306.64	20,306.64
	Installation of solar systems in 400 households of the Capital City of Podgorica	768.84	768.84
	Introducing saving lamps in all of the households of the Capital City	12,396.94	12,396.94
	Thermal insulation of the external cladding – façade of collective residential facilities by funding system 50%-50%	685.44	685.44
	TOTAL	**34,157.86**	**34,157.86**
COMMERCIAL AND SERVICE SECTOR	Making of the city assembly's decision on reducing the compensation for utility equipping for building of facilities of designed energy consumption of up to 45/15 kWh/m^2 a year (according to the low energy, that is, passive standard)	2,326.21	2,326.21
	Conditioning incentives by using renewable energy sources for generation of heat	2,714.15	2,714.15
	Installation of saving lamps for commercial and service sector	1,620.30	1,620.30
	Making of the city assembly's decision on reducing the compensation for utility equipping and reconstruction of buildings in commercial and service sector that are using renewable energy sources.	1,162.87	1,162.87
	TOTAL	**7,823.54**	**7,823.54**
TOTAL FOR BUILDING SECTOR		**43,810.07**	**43,810.07**

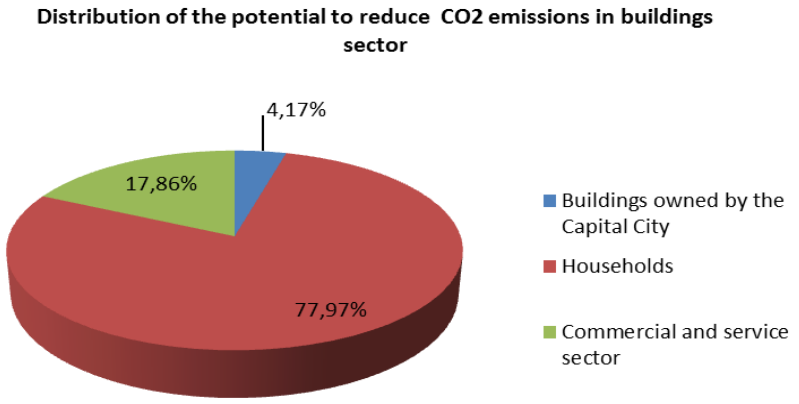

Figure 9.3 Distribution of the potential for reducing the CO_2 emissions of the building sector of the Capital City of Podgorica

The total potential for reducing the CO_2 emissions in the building sector is 43,810.07 t CO_2, residential sector contributes with 77.97% to this potential, which in t CO_2 means 34,157.86, commercial and service sector contributes with 17.86% that is, 7,823.54, while the remainder of 4.17% that is 1,828.68 t CO_2 belongs to the buildings owned by the Capital City.

Scenario with measures was created in the manner to take into account measures presented in tables 9.7 and 9.8. Emission of CO_2 scenario with measures was determined as the difference between the emission of the scenario without the measures and potential of reduction. The Table 9.10 shows energy consumptions, and Table 9.11 emissions of the scenario with measures.

Table 9.10 Consumption of energy sources in the scenario with measures for the buildings sector

CATEGORY	Energy consumption (MWh), Scenario with measures, 2020			
	Electricity	Natural gas	Fuel oil	Biomass
BUILDINGS OWNED BY THE CAPITAL CITY	7,167.73	11.60	477.80	193.30
COMMERCIAL AND SERVICE BUILDINGS	119,973	0	0	0
RESIDENTIAL BUILDINGS - HOUSEHOLDS	393,244.8	0	0	58,212.5

TOTAL	**520,385.53**	**11.60**	**477.80**	**58,405.80**

Table 9.11 Projection of CO_2 emission of the scenario with measures for the buildings sector

CATEGORY	Emission of t $C0_2$, Scenario with measures, 2020.			
	Electricity	Natural gas	Fuel oil	Biomass
BUILDINGS OWNED BY THE CITY	3,411.72	2.40	134.55	0.00
COMMERCIAL AND SERVICE BUILDINGS	57,107.36	0.00	0	0
RESIDENTIAL BUILDINGS - HOUSEHOLDS	187,184.44	0.00	0	0
TOTAL	**247,703.53**	**2.40**	**134.55**	**0,00**

The tables 9.8 and 9.9 show savings and potentials for reduction for each measure separately.

After comparing the scenario without the measure with the scenario with the measure the conclusion can be drawn that the emission of scenario with the measure is 15.02% less. After comparing the CO_2 emission of the scenario with the measure with the CO_2 emission in 2008 it comes out that the same is 7.25% lower than the emission from 2008. Total CO_2 emissions and energy consumption of both scenarios, with comparison to the emission in 2008, is shown in table 9.12 and figure 9.4.

Table 9.12 Projections of the building sector as per the scenarios

Scenario	Energy consumption, MWh		% compared to 2008	Emission t CO_2		% compared to 2008
	2008	2020		2008	2020	
Scenario without measures	615,160	671,318.70	9.13	267,216	291,650.55	9.14
Scenario with measures	615,160	579,280.73	-5.83	267,216	247,840.48	-7.25

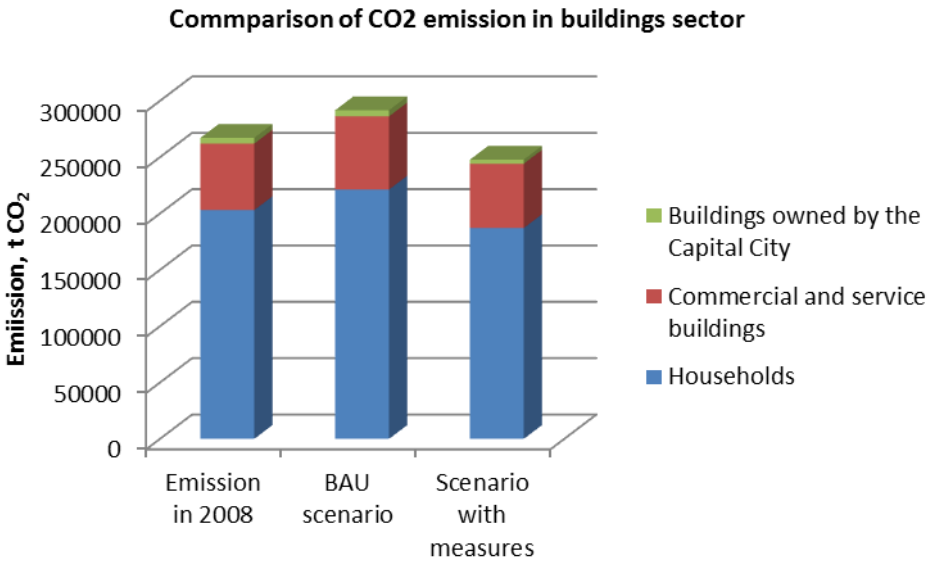

Figure 9.4 Comparison of projections of CO_2 emissions with the emission in 2008 in the building sector

9.4. CO_2 emissions projections in the public lighting sector

Based on the known electricity consumption of the sector of public lighting of the Capital City of Podgorica in 2008, and expected consumption growth by 2020, the scenario without the measure was created. Projections of the electricity consumptions in the public lighting sector by 2020 as well as the related emission of CO_2 are shown in Table 9.13.

Table 9.13 Electricity consumption and CO_2 emission of the scenario without the measure, for the public lighting sector

Public lighting	Energy consumption 2008, MWh	Increase of electricity consumption in MWh in 2020	Energy consumption in 2020 BAU scenarios, MWh	Emission of BAU scenario, t CO_2
Electricity	11,353	1,135.2	12.488.2	5,944.4

Scenario with the measures includes three measures, for which the potentials for energy savings and related CO_2 emissions are shown in Table 9.14.

Table 9.14 The list of measures and associated savings and the potential for reducing CO_2 emissions of the public lighting sector

Name of the measure	Estimate of savings MWh	Potential of reduction of the emission t CO_2
Replacement of obsolete lights with energy more efficient and ecologically more acceptable lights	185.5	88.298
Managing the intensity of public lighting	2,606	1,240.456
Reconstruction of old connections to the power distribution network	500	238
TOTAL	**3,291.5**	**1,566.75**

The total potential of reducing the CO_2 emissions in the sector of public lighting of the Capital City of Podgorica by 2020 is 1,566.75 t CO_2.
After comparing the emission of CO_2 from the scenario with measures with the emission from 2008 it comes out that it is 18.99% less than the emission of CO_2 in 2008. The total emission and energy consumption of both scenarios and their comparison with the CO_2 emission in 2008 is shown in Table 9.15.

Table 9.15 Projections of the public lighting sector as per the scenarios

Scenario	Energy consumption, MWh		% compared to 2008	Emission of t CO_2		% compared to 2008
	2008	2020		2008	2020	
Scenario without measures	11,353	12,488.2	10.00	5,404	5,944.4	10.00
Scenario with measures	11,353	9,196.7	-18.99	5,404	4,377.65	-18.99

9.5. Overall CO_2 emissions projections of the Capital City of Podgorica

Projections of CO_2 emissions were made for all of the three sectors of final energy consumption of the Capital City of Podgorica: transport, buildings and public lighting. While preparing the projections we used the emission factors identical to those used when preparing the inventory for the baseline year, although the factors for identifying direct CO_2 emissions vary from year to year, considering the method of generation of electricity and thermal energy.

Table 9.16 shows an overview of total emissions of the inventory as per the sectors, for scenario without measures and scenario with measures. The largest share in total emissions of the scenario without measures belongs to the transport sector, while it belongs to the building sector in the scenario with measures. Share of the transport sector in total emissions of CO_2 of the scenario without measures is 54.39%, while share into the scenario with measures is 43.77%. Share of the building sector in emissions of the scenario without the measures is 44.70%, while in the scenario with measures the share is 55.25%. From the presented shares it can be concluded that transport is the sector with the highest potential for reducing CO_2 emissions (Table 9.16 and Figure 9.5). Emission of CO_2 of the scenario with measures in this sector has been reduced by 34.27% in relation to 2008. CO_2 emission in the public lighting sector has been reduced by 18.99%, while emission of the building sector has been reduced by 7.25% in relation to the emission of the baseline year. Total reduction of the inventory in relation to the baseline year is 21.49%.

Table 9.16 Projections of the inventory emissions for the scenario without measures and the scenario with measures

Scenario	Sector	Emission t CO_2		% compared to 2008
		2008	2020	
Scenario without measures	Transport	298,672	354,883	18.82
	Building	267,216	291,650.6	9.14
	Public lighting	5,404	5,944.4	10.00
	TOTAL	**571,292**	**652,478**	**14.21**
Scenario with measures	Transport	298,672	196,331.15	-34.27
	Building	267,216	247,840.48	-7.25

	Public lighting	5,404	4,377.65	-18.99
	TOTAL	**571,292**	**448,549.28**	**-21.49**

The total emission of scenario without measures is 652,478 t CO_2, which in relation to 2008 is an increase of 14.21%. Total potentials for reduction of CO_2 emissions as per the sectors in 2020 are presented in Table 9.17.

Table 9.17 Total potentials for reducing the CO_2 emissions as per the sectors

Sector	Potential of reduction, t CO_2	Share in the total potential, %
Transport	156,449.10	77.52
Building	43,810.07	21.71
Public lighting	1,566.75	0.78
TOTAL	**201,825.92**	**100.00**

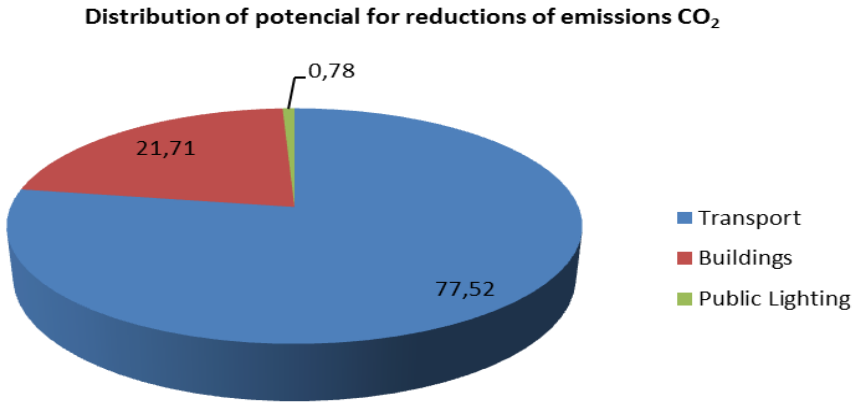

Figure 9.5 Distribution of potential for reducing the CO_2 emissions (%) of the inventory as per the sectors

Total potential for reduction of emissions in 2020 for the Capital City of Podgorica is 201,825.92 t CO_2. Transport is the sector having the highest potential for reducing the emissions, which is 156 449.10 t CO_2, which is equivalent to the share of 77.52%. Potential for reducing the emissions in the building sector is 43,810.07 t CO_2, which share wise is 21.71%. The lowest share of 0.78% in relation to the total potential belongs to the public lighting sector.

Figure 9.6 shows total CO_2 emissions in 2020 for the scenario without measures and the scenario with measures, as well as the comparison with the emission from 2008 and indicative target.

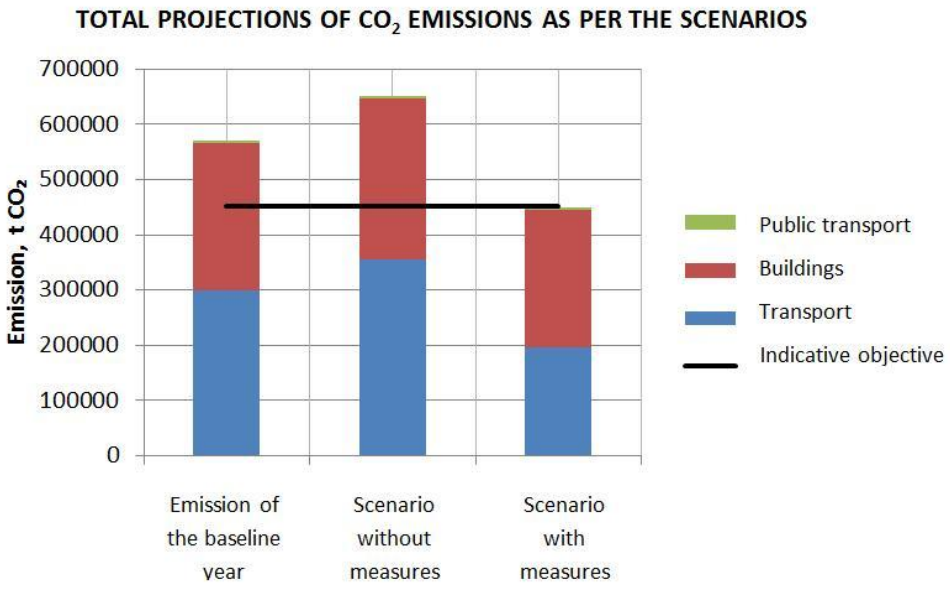

Figure 9.6 Total projections of CO_2 emissions as per the scenarios

The proposed indicative target of reducing the CO_2 emissions is 21% in 2020, in relation to the emission from 2008, which is equivalent to the emission of 451,320.68 t CO_2 (black line in Figure 9.6). The total emission of scenario with measures will in 2020 be 448,549.28 t CO_2 which is 2,771.40 t CO_2 below the proposed target.

9.6. Conclusion

By signing the Agreement of Mayors, the Capital City of Podgorica joined the European initiative for reduction of emission of greenhouse gases and proposed the indicative target for reducing the CO_2 emissions of 21% (451,320.68 t CO_2) in 2020, in relation to the emission in 2008.

For purposes of estimating the reduction of CO_2 emissions in 2020 for the identified measures of energy efficiency for sectors of buildings, transport and public lighting in the Capital City of Podgorica the projections were prepared on developments of energy consumptions and emissions in 2020 for two scenarios: scenario without measures and scenario with measures. The emission of the scenario without the measures in 2020 will be 652,478 t CO_2, which is 201,157.3 t CO_2, that is, 44.57% more than the proposed indicative target, and it can be concluded that without application of measures the proposed target will not be able to achieve. Still, if all of the foreseen measures are

applied, emission of the scenario with measures will be 448,549.28 t CO_2, which is 2 771.4 t CO_2 below the proposed indicative target. With implementation of all of the proposed measures, the emission of CO_2 in 2020 will be less than the indicative target by 0.49%, which means it will not be necessary to undertake all of the identified measures for reaching the target of reducing the emissions by 21%.

10. Financing mechanisms for the Action Plan implementation

10.1. Overview of potential sources of financing

The Capital City of Podgorica has substantial sources at its disposal to finance the proposed measures and activities in the form of grants through various European Union programs. It is important to emphasize here that possibilities of using the above mentioned sources will significantly increase after Montenegro joins the European Union, which will also make funds from the structural funds at its disposal. In order to use the funds from EU programs it takes a lot of efforts to apply projects to various public invitations within the various programs, which implies building of human resource capacities through establishment of special working groups within the city administrations that are going to monitor opening of public calls, as well as preparation of project proposals in accordance with the laid down requirements.

10.2. Capital City Budget

Budget of the Capital City is prepared in accordance with the Law on Funding of the Local Self-Government ("Off. Gazette of the Republic of Montenegro", no. 42/03, "Off. Gazette of Montenegro", no. 05/08, 51/08 and 74/10) governing the sources of funding, method of financial settlement and use of conditional subventions, as well as the method of funding own affairs of the local self-governance. The Budget of the Capital City is a basic financial document, estimating incomes, receipts and expenditures for one fiscal year. Budgetary funds are used to fund activities, functions and programs of the Capital City, in the level which is essentially needed for performing them. In past years, the budget of the Capital City has recorded constant growth, however, due to the global crisis whose consequences had also reflected the macro economic situation in the state, the budget for 2011 is € 68,316,950.00, implying the reduction of investment in long-term investment activities.

Borrowing possibilities of the Capital City are specified by the above Law on Funding the Local Self-Government which is providing the opportunity of taking long-term loans only for purposes of funding Capital City investment expenditures or for purposes of buying Capital City assets in accordance with the approved multi-annual investment plan. Borrowing might be such that total repayment of the principal and the interest in the specific year of repayment must not exceed 10% of achieved **current revenue** in the year preceding the borrowing, and with the prior Government's consent.

From the energy efficiency point of view, incorporation of the Office for Energy Efficiency in October 2010 will be of a special significance, since its activities will consolidate programs and projects in the level of the Capital City, regarding energy efficiency. Strategic documents that have been passed in some of the sectors (transport, lighting) will have a special impact on future defining of budgetary assets. This will be especially important because the current budgetary and investment planning does not single out and does not sufficiently recognize funding of projects and activities in the energy efficiency field.

The instrument of the so called green public procurement, which is widely distributed in most of the European Union countries, has not been introduced in Montenegro. The above is based on the principle that ecological and energy efficient services and equipment have advantage in relation to the non-ecological services and equipment.

10.3. Public-private partnership

Public-private partnership (PPP) is a joint, cooperative action of the public sector with the private sector. The public sector is the one offering cooperation - as a contractual partner that defines the types and scope of works or services it is intending to assign to the private sector and the one offering execution of public jobs to the private sector. The private sector appears as a partner who demands such cooperation, if it can obtain the business interest (profit), who will be required to qualitatively perform the contracted tasks. The public-private partnership is a relatively new mechanism in Montenegro, but is increasingly becoming an instrument of application. Government has decided to use this model intensively in the privatization process, and has therefore "opened" all sectors for the PPP. However, the PPP is still in the development stage. Also, the legislative framework for the PPP, although improved by the adoption of the Law on Concessions ("Off. Gazette of Montenegro", no. 80/09) is not in the appropriate level yet. Accordingly, in order to achieve more efficient and more comprehensive use of this instrument, it will be necessary to transpose entries from the EU Directives governing this area into the national legislation, especially in the part regarding defining concessions for public works, appropriate procedures, as well as the regularities of the competitive dialogue.

Setting up the public-private partnership aims at more efficient, more effective implementation of public works. PPP appear in different fields of public administration in different forms, with different lifetime and with the different intensity. Characteristics of PPP are as follows: long-term contractual cooperation between the public and private sector and actual redistribution of business risks of building, availability and demand (two out of three risks have to be on the private partner).

10.4. ESCO model

ESCO is the abbreviation of Energy Service Company and is the generic name for the concept in the market of services in the energy sector. ESCO model includes the

development, construction and financing of projects aiming at improving energy efficiency and reducing operation and maintenance costs. The goal of each project is reduction of energy and maintenance costs by installation of new energy more efficient systems, ensuring the repayment of the investment through accomplished savings in the period of several years, subject to the client and the project.

The risk for achieving savings is as a rule taken by ESCO company by providing guarantees, and in addition to innovative projects for improving energy efficiency and reducing energy consumption, the financial solutions for their implementation are often offered. During the repayment of investment for energy efficiency, the customer pays the same amount for the cost of energy as before the implementation of the project, which is divided into actual (reduced) energy cost and the cost to repay the investment. After repayment of the investment, the ESCO company leaves the project and grants all of the benefits to the Client. All projects are specifically tailored to the Client, and the expansion of the project is possible by inclusion of new energy efficiency measures with appropriate share of the investment. Thus, the client is able to modernize equipment without investment risk, since the risk of achieving the savings can only be assumed by ESCO company. In addition, after repayment of the investment the client achieves positive monetary flows in the period of repayment and long-term savings.

Additional advantage of ESCO model is the fact that during all phases of the project the service beneficiary cooperates with only one company, as per the principle all in one place, and not with many different entities, which is significantly reducing the costs of energy efficiency projects as well as the risk of investing in them. Also, ESCO project includes all of the energy systems in particular site, which is enabling an optimal selection of the measure with favourable relation between the investments and the savings.

Beneficiaries of ESCO services may be private and public companies, institutions and units of local self-governance.

10.5. Revolving fund

Revolving fund is a financial mechanism specialized for funding of clearly defined projects that are grounded on multilateral agreements between the state/international institutions and financial institutions. The reason for establishing of the revolving fund is the discrepancy between the market claim and the demand for funding energy efficient projects. There are several different models, that is, methods in which the fund can be established and funded.

The first model involves the agreement between the state and the commercial banks on the establishment of a revolving fund, whereat the funds are collected from the State Budget or through the earmarked taxes. Initial, normally grant funds of the Fund can be provided by international institutions such as the GEF (Global Environmental Facility) or the World Bank. For funding the energy efficient projects the commercial banks are

granted interest-free loans from the Fund itself, which results in interest rates than are more favourable than the market ones. However, banks are entitled to ask for the credit guarantee in the form of financial or substantive property of the Borrower. End users can be public companies, institutions and local self-governments, small and medium entrepreneurs and ESCO companies. Banks that are committed to repay the borrowed funds into the Fund in time, or otherwise will pay the accrued interest, will take the due care about the collection of placements. In this way, the state is secured from the market risk, other than the cost of the borrowed interest-free funds. As the loans are being returned into the fund, the funds for granting new loans are released, thus having the constantly circulating money within the system. The biggest deficiency of this concept is certainly the need of introducing additional tax payments from which the fund would be financed.

The second model differs from the first one primarily in method of funding and the decreased role of the state. Instead of the non-interest funds, commercial banks are enable to use the guarantee that are usually issued by international institutions such as GEF. Based on the guarantee for which they are paying certain interest rate, the banks are promoting commercial credits at interest rates lower than the market ones. So far, three successful implementations of this model have been recorded in the region, all in former candidate countries for joining the EU:

1. CEEF - Commercializing Energy Efficiency Finance
2. HEECP - Hungary Energy Efficiency Co-Financing Program
3. REEF - Romanian Energy Efficiency Fund

Despite the fact that the majority of former experiences in using the revolving fund financial mechanism have been restricted to the funds in the national level, this mechanism can be successfully applied to funding projects at local level.

10.6. Montenegrin Development Bank

The mission of the Montenegrin Development Bank is stimulating the sustainable development of Montenegrin economy. The founding Capital City of Montenegrin Development Bank is € 100,000,000 and is paid in by the state of Montenegro from the state budget.

The founding Capital City of Montenegrin Development Bank is made of one ownership share that can neither be divided, transferred, nor pledged and is in sole ownership of the state of Montenegro.

By its operations, Montenegrin Development Bank is, within its competencies, stimulating systematic, sustainable and equal commercial and social development in accordance with the strategic objectives of the state of Montenegro.

Activities of Montenegrin Development Bank are primarily as follows:
1. financing the development of Montenegrin economy,

2. financing infrastructure,
3. stimulating production and export,
4. stimulating development of small and medium entrepreneurship,
5. stimulating environmental protection,
6. insuring export of Montenegrin products and services against non-market risks.

Aiming at carrying out its activities, Montenegrin Development Bank:
1. approves credits and other placements,
2. issues bank and other guarantees,
3. enters into the insurance and reinsurance contracts,
4. invests in borrower and owners instruments,
5. performs other financial operations and services aiming at carrying out its activities.

10.7. Environmental Protection Fund

Provisions of the Environmental Law ("Off. Gazette of the Republic of Montenegro", no. 48/08) stipulate that the funds for preparation, implementation and development of programs, projects and other activities contributing the conservation, sustainable utilization, protection and improvement of the environment, energy efficiency, as well as to the accomplishment of the objectives and methods of sustainable development and citizens' rights to the environment will be provided in the Environmental Protection Fund.

Activities that are carried out indicate that Eco Fund will soon be established in Montenegro. For the purpose of implementation of this important project, a feasibility study was prepared, elaborating the future method of functioning of the Eco Fund. The adoption of a special law will define the form of the Eco Fund, its activity and scope of works, as well as the sources of operational funds.

10.8. Investment and Development Fund of Montenegro

Investment and Development Fund (IRF) was established in December 2009 after the adoption of the legislative framework for the same and stands for the legal successor of the Development Fund. Among other things, the activity of this Fund refers to approval of credits and issuing guarantees that: stimulate establishment and development of small and medium enterprises; provide support to infrastructure projects, water supply projects and waste water treatment and environmental improvement projects, which are also funding the projects of local, regional and state significance.

The Fund may use international funds, borrow in Montenegro and abroad in the market of money and Capital City, in order to carry out activities in accordance with the law and regulations of the business policy of the Fund, with the consent of the founders.

The former Development Fund of Montenegro has, since 2006, dealt with supporting the implementation of infrastructure and environmental projects. The highest demand

regarding the funds designated for this type of support was present at local governments, and at public and the private companies.

According to the mid-term program of work, the Investment Development Fund will financially support the projects of public companies, private enterprises, local governments, and in exceptional cases companies owned by the state, which will result in resolving of infrastructure and / or environmental issue, or will lead to a more efficient use of energy or introduction of renewable energy sources use . It is important to emphasize that in this case the estimate will be made if holder of the project is able to return the funds approved (if the arrangement implies repayment thereof).

Effects will be reflected in resolving of the most pressing environmental and infrastructure problems, improving of energy efficiency, a range of benefits for the citizens living in the project implementation area, and finally, better conditions will be created for realization of business ideas of small and medium enterprises.

There are different mechanisms available to the IRF, which can support the projects of infrastructure or environmental significance: credit arrangements (provision of credit support by and in and cooperation with commercial banks or directly); issuing guarantees for investments (in this case, the Investment Development Fund, through provision of guarantee, allows the beneficiary to get to the favourable financial assets); purchase of bonds in the Capital City market (mechanism that was present at the Development Fund of Montenegro); Public-Private Partnership (implementation of projects in cooperation with private companies);

It is important to emphasize that selection of potential projects is going to be performed in cooperation with competent non-governmental institutions and that the IRF will be guided by the principle of economic viability of the project, its social justification and corporate social responsibility. It should be stressed that in future we will try to get in touch with international financial institutions funding the programs of ecological and infrastructure character, and energy efficiency projects, in order to possibly secure additional funds for this type of activities.

10.9. European Union Programmes and Instrument for Pre-Accession Assistance

European Union funds, intended for energy efficiency projects and renewable energy sources, are available through different European Union Programmes and Pre-Accession Assistance Programmes. Pre-Accession Assistance Programme is specific for each country and is harmonized with the European Commission, while European Union Programmes are intended for all members of the EU, and also for all associated members which, based on the Memorandum of Understanding, access to the programme for participation and pay the membership fee in the same.

10.9.1. Instrument for Pre-Accession Assistance – IPA

In the period from 1998 since when Montenegro has been using EU funds, to 2010, our country was awarded financial aid funds in excess of more than € 408.5 million Euros. In the period from 1998 to 2006, the said funds have included the EU CARDS assistance in the value of € 277.2 million Euros.

In 2007, the CARD program has been replaced by the Instrument for Pre-Accession Assistance (IPA), which covers the period until 2013. The purpose of IPA funds is assistance to candidate countries (at this moment these are: Croatia, Macedonia, Montenegro and Turkey) and potential candidate countries (Albania, Bosnia and Herzegovina, Serbia and Kosovo under UNSCR 1244) towards meeting the Copenhagen political and economic criteria, and adoption and implementation of EU acquis communautaire.

The Ministry of Foreign Affairs and European Integration of Montenegro is the institution responsible for coordination and implementation of the cross-border cooperation program in our country, while the EU Delegation to Montenegro has the contracting authority.

Montenegro currently has access to Component I - Assistance in transition and building of institutions and to Component II - Cross-border cooperation, and as a candidate country, it also has the Component III available - Regional Development (transport, environment, economic development) and Component IV - Human Resources Development, but the same become operational only after obtaining the accreditation for decentralized implementation system of managing EU funds. The Ministry of Finance will be responsible for application of this system, which will allow greater autonomy of utilization and distribution of funds.

The Capital City of Podgorica can take part in projects through cooperation with Albania, Bosnia and Herzegovina, Croatia and Serbia. It should be emphasized that, except with Albania, it can participate with other specified countries as an associate member, that is, as the area where you can use 20% of total budgetary programme.

According to the multi-annual Indicative document (Multi-annual Indicative Planning Document - MIPD) of the European Commission, for the period 2010-2012 there are some anticipated allocations for Montenegro in total amount of €104.1 million, for components I and II. More precise overview by years and amounts is shown in Table 10.1.

Table 10.1 Allocation of funds for the period 2010-2012.

Component	**2010 (amount in €)**	**2011 (amount in €)**	**2012 (amount in €)**	**Total 2010-2012**
I Assistance in transition and	29,238,823	29,843,599	30,446,471	**89,528,893**

building of institutions				
II Cross-border cooperation	4,761,177	4,856,401	4,953,529	**14,571,107**
Total	34,000,000	34,700,000	35,400,000	**104,100,000**

10.9.2. Transnational cooperation programmes

Montenegro participates in two transnational cooperation programmes: Transnational cooperation programme for South-East Europe (SEE) and Mediterranean Programme (MED).

10.9.2.1. The South East Europe Transnational Cooperation Programme (SEE)

The South East Europe Transnational Programme is funded by the European Regional Development Fund, and its general objective is development of transnational partnerships regarding the issues of strategic significance for the process of territorial, economic and social integrating, and also for accomplishing cohesion, stability and competitiveness.
The programme area includes 16 European countries: Albania, Austria, Bosnia and Herzegovina, Bulgaria, Montenegro, Greece, Croatia, Italy (11 regions), Hungary, Macedonia, Moldova, Romania, Slovenia, Serbia, Slovak Republic and Ukraine.

Priority areas this program is focused to are:

1. Developing innovative approaches and entrepreneurship;
2. Protection and improvement of the environment;
3. Improving accessibility;
4. Development of transnational synergies for sustainable development of the area.

One of the issues that have been emphasized under the environmental protection and improvement is promoting energy efficiency and use of alternative resources.

The programme is intended to non-profit organizations and institutions, the program partnership is set up between at least three different states, one of which must be the EU member. Also, the partners are involved in co-financing of the project with a joint share of 15%. A significant segment of the programme relates to stimulation of non-EU members to participate.

10.9.2.2. The Mediterranean Programme (MED)

The Mediterranean Programme (MED) aims at strengthening cross border cooperation through local and regional initiatives, strengthening transnational cooperation in activities leading to integrated territorial development, and strengthening of interregional cooperation and sharing experiences.

The above program covers the following countries: Cyprus, France, Italy, Malta, Portugal, Slovenia, Spain, Great Britain and Greece. In addition to these countries, the Mediterranean countries and potential candidates are also entitled to participate, provided that the stakeholders finance their participation themselves from the Instruments of Pre-Accession Assistance. In this sense, Montenegro and Croatia have agreed to take part in the MED Programme.

Priority areas relevant to the Programme, within the framework of support to the trans-national cooperation of partners from countries / regions of the EU and IPA, are building capacities for innovation, environmental protection and sustainable territorial development, improving mobility and territorial accessibility, polycentric and integrated development of Mediterranean region.

10.9.3. European Union Programmes

Community Programmes stand as one of the instruments of pre-accession assistance of the European Union, enabling the beneficiary states to get familiar with relevant policies and integration to the same. Montenegro acquired the right to participate in these Programmes after signing the Agreement on temporary enforcement of Protocol 8 of the Association and Stabilization Agreement in November 2007. Our country participates in the Competitiveness & Innovation Programme (Competitiveness & Innovation Programme – CIP) and the Seventh Framework Programme for Research (Seventh Framework Programme for Research - FP7).

10.9.3.1 Competitiveness and Innovation Framework Programme (CIP) / Intelligent Energy for Europe Programme (IEE)

Competitiveness and Innovation Programme (CIP) is divided in three programs of which the Intelligent Energy for Europe Programme (IEE) covers the areas of environmental protection and energy efficiency. For the period from 2007 - 2013 CIP has the budget of 3.6 billion euro at disposal, of which the IEE programme has 730 million euro at disposal.

Competitiveness and Innovation Programme (CIP) can be divided in three following programmes:

- The Entrepreneurship and Innovation Programme EIP

- Programme of supporting the policy of informative and communication technology
- Intelligent Energy for Europe Programme (IEE)

Representatives of the European Commission and the Ministry of Economic Development of Montenegro have signed, on March 3, 2008, the Memorandum of Understanding for participating in the Entrepreneurship and Innovation Programme.

The Intelligent Energy for Europe Programme (IEE), covering areas of environmental protection and energy efficiency, cannot be joined by EU non-member countries, meaning that the above programme is not available to Montenegro, but bearing in mind its aspirations of joining the EU, the gained experiences should be perceived and accepted in order to create possibilities for inclusion into this (if they pertain to the future period as well) or into the similar programmes.

The primary objectives of IEE programme are as follows:

- increase energy efficiency as well as the rational use of energy sources;
- promoting and stimulating use of renewable sources;
- promoting energy efficiency and use of new and renewable energy sources in transport

Within the above programme the European Commission is co-funding the following four areas:

a. SAVE (improving energy efficiency and promoting rational energy use , especially in buildings and industry), with annual budget of €7.7 million, also implying specific priorities such as:

- energy efficient buildings;
- energy efficiency in industrial plants;

b. ALTENER (promoting use of new and renewable energy sources for generation of electricity and heat), with annual budget of €19.6 million, also including the specific priorities such as:

- electricity from renewable energy sources;
- heating/cooling from renewable energy sources;
- renewable energy sources in households;
- bio fuels;

c. STEER (promoting more efficient energy use , as well as the application of new and renewable fuels in transport), with annual budget of € 50 million, whose specific priorities are as follows:

- alternative fuel and clear vehicles;
- energy efficient transport;

d. Integral activities (combination of the above stated areas)-priorities:

- establishment of local and regional energy agencies;
- European networking for local actions;
- initiative of energy services;
- initiative of education in area of intelligent energy;
- initiatives related to product standards;
- initiative of combining heat and electricity.

10.9.3.2. The Seventh Framework Programme - FP7

The Seventh Framework Programme FP7 (*FP – Framework Programme*) is the principal European Union instrument for financing scientific research and development, recognizing different entities as target groups, such as: university, administrative authorities, small and medium enterprises and research institutions. On January 25, 2010 the representatives of the European Commission and the Ministry of Education and Science of Montenegro have signed the Memorandum of Understanding for taking part into this programme.

Different from the former framework programmes that lasted from three to five years, the Seventh Framework Programme will last seven years, starting from January 1, 2007 to the end of 2013. FP7 is designed so as to improve the success with regard to the previous programmes that aimed at establishment of European research area and economy development of Europe.

The Seventh Framework Programme is organized within the four programmes that have been harmonized with four basic components of EU research, plus the fifth special programme for nuclear research (EURATOM):

- Cooperation, supporting the international cooperation in research aiming at strengthening competitiveness of European production, especially in areas of energy and environment;
- Ideas, within the meaning of support to pioneer research through financing multi disciplinary research projects of individual teams;
- People, through supporting their future education, mobility and professional development of researchers;
- Capacities, support to building and optimal use of research and innovative capacities throughout Europe.

  The total budget of FP7 is €50.5 billion, with additional €2.7 billion for a five year Euroatom programme.

As said before, important thematic areas of the cooperation programme are energy and environmental protection, and research primarily pertains to adjusting the current system to the more sustainable, competitive and safer system.

Institutions such as universities, research centres, commercial companies (especially small and medium enterprises) or independent researchers, local self-government units from many member countries and from the third countries may apply to the FP7 tenders. The consortium of the project drafters usually includes complementary members from the sectors of management and science.

CONCERTO program

There is a special initiative launched under FP7 program by the name of CONCERTO. The basic goal of CONCERTO is to support local communities in implementation of activities for the increase of energy efficiency, the use of renewable energy sources and development of new and innovative technical solutions for local communities' sustainable energy development.

The annual CONCERTO budget is 150 million Euro and beneficiaries of this initiative are research centres, companies, small and medium enterprises, agencies, chambers, local and regional governments and universities. Participating countries must be EU member states, candidate countries and Lichtenstein, Norway and Iceland.

European Commission co-funding in CONCERTO projects is 50% to 100% of direct costs, depending on activities and applicant's legal status.

Acceptable activities within this program include the following:

- Integrated use of renewable sources of energy and energy efficiency measures
- Construction of eco-buildings
- Building boiler rooms operating on biomass
- Setting up co-generation system
- Efficient management of energy consumption and its storage and the increase of safety related to energy procurement to consumers

Communities that are involved in the CONCERTO program provide significant benefits to all citizens, both on local, regional, national and international level when it comes to fighting climate change and improving security of energy supply.

Today, about 5 million European citizens live in the CONCERTO communities and about 300,000 people directly (live or work in the buildings) or indirectly benefit from activities within the CONCERTO project. It is estimated that the CONCERTO communities will achieve CO_2 reduction by about 310,000 t/ year before 2010.

10.9.4. Open Regional Funds for the South East Europe

In 2007, the German Organization for International Cooperation (GIZ) established, on behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ) an Open Regional Fund for the South East Europe as a new instrument to finance regional development projects. Generally, GIZ projects are often focused on ensuring technical preconditions for local governments to apply for EU funds, independently or in partnership with other local governments.

The above mentioned instruments complement the standard technical cooperation mechanisms, such as consulting, networking, knowledge management and training, providing support to beneficiaries in the region to develop, apply and implement their own projects independently.

In the projects to be financed under the Fund, the partners may come from the public, civil society and private sector from SEE countries - Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro, Serbia, Kosovo, and to a certain extent from Bulgaria and Romania. The projects must involve more than one country, and the results should be transferable/ applicable in other countries. In addition, the goal of the future projects is to contribute to the harmonization of EU support through the stabilization and accession process and implementation of the EU Acquis.

There are four funds under the Open Regional Fund for the South East Europe related to the following:

• International trade

• Modernization of municipal services

• Legislative reform

• Energy Efficiency and Renewable Energy

The goal of the Open Regional Fund for Energy Efficiency and Renewable Energy for SEE is to finance projects for the safe supply of energy through rational energy use and increased use of renewable energy sources.

A condition for joining the Open Regional Funds for Energy Efficiency and Renewable Energy is that project partners come from at least three countries and that they each provide equal financial contribution. The Project duration is typically between 2-3 years. The Fund financial participation in the project is € 100,000 – 400,000 or through development of case studies and strategies, etc... The project must be approved by the German Federal Ministry for Economic Cooperation and Development (BMZ).

10.9.5. European Bank for Reconstruction and Development (EBRD)

European Bank for Reconstruction and Development was established in 1991 as an international financial institution to help countries in transition to market economy and democratic system. The Bank is headquartered in London and is owned by 61 countries

and two international institutions: the EU and the EIB. Investments are provided in 29 countries in Europe and Asia. Beneficiaries of funds primarily come from the private sector. EBRD also work closely with regional banks in financing projects in the public sector.

In order to get the funding, the following conditions must be met:

- A project must be implemented in the EBRD member countries
- A project must have significant market perspective
- Financial contribution of investors must be significantly higher than EBRD
- A project must contribute to local economy and development of private sector
- A project must comply with strict financial and environment protection criteria

Standard EBRD funding goes to projects in agriculture, energy efficiency and energy supply industrial production, infrastructure, local communities, tourism, telecommunications and transport. The EBRD funding is implemented through loans and securities in the amount of € 5 to 230 million. Projects with smaller budgets can be financed indirectly through private banks or special development programs. The loan repayment period ranges from one to 15 years. The EBRD funding is adjusted to the specifics of a region or sector in which the project takes place. The EBRD contribution to the project amounts to 35%, but can be much higher.

Activities of the European Bank for Reconstruction and Development in Montenegro are focused on development of infrastructure in local communities, the environment protection, transport, and development of small and medium enterprises. Investments of this institution in our country in 2009 reached € 25.7 million and the largest part of this amount was related to the improvement of the railway infrastructure. In 2010, Electricity Management Company of Montenegro was awarded EBRD long-term loan in the amount of € 35 million for procurement and installation of new electric meters throughout the grid. This activity will be an important step in the modernization of the power grid of Montenegro, and the expected reduction in CO_2 emissions will be approximately 88,000 tons per year.

- **Western Balkans Sustainable Energy Credit Line Facility (WeBSECLF)/EU/EBRD**

The project called The Western Balkans Sustainable Energy Credit Line Facility (WeBSECLF) was launched in 2009 by the European Bank for Reconstruction and Development, to ensure opportunities for banks in the Western Balkans to provide loans for projects that focus on increasing energy efficiency and the effective use of renewable energy sources.

The above line of credit provides funds for further loans to small and medium-sized enterprises to banks in Serbia, Bosnia and Herzegovina, Macedonia and Montenegro, for a total of 60 million Euros. Individual loan amounts range from € 100,000 to 2 million. The maximum value of the project may be € 5 million while own contribution is a minimum of 15% of the project value.

The objectives of the project WeBSECLF refer to:

- Improving access to long-term financing of investments in private companies (excluding working capital)
- Incentives for small and medium enterprises to invest in sustainable energy (EE and RES)
- Promoting sustainability and competitiveness of the industrial sector
- Build capacity of local banks to finance investment and evaluation in the field of sustainable energy
- Providing support to companies in the process of financing investments in the field of sustainable energy.

Eligible investments in energy efficiency within the project must be in accordance with at least one of the following criteria:

- Energy Saving Ratio (ESR) - equal to or higher than 30%, in the construction sector, on an annual basis;
- ESR is equal to or higher than 20% in all other cases annually;
- Reduction of greenhouse gas emissions, i.e. CO2 emissions, which is equal to or greater than 20% per annum expressed in tons of CO2.

It is important to emphasize that WeBSECLF anticipates providing additional incentives to applicants for successfully implemented projects, in a certain percentage of the loan amount realized for the following:

- Projects for energy efficiency in industry - 15% for all measures and for the replacement of boilers and cogeneration / tri-generation 20%;
- Projects for application of renewable energy - 15% in states where they have been feed-in tariffs, 20% of which have not been adopted feed-in tariffs;
- Projects related to energy efficiency of buildings and projects related to renewable energy - 20% for all measures.

10.9.6. European Investment Bank

The European Investment Bank (EIB) is the European Union's financial institution specializing in financing long-term projects that support the development policy of the EU. In was founded under the Treaty of Rome in 1958 and is owned by the member states.
Bank priorities are:

- Support and economic cohesion policy of the EU
- Development of Trans-European Networks (TEN)
- Support the development of small and medium enterprises
- Protection of the environment
- Support sustainable development of the energy sector

The beneficiaries of the EIB may come from the public and private sectors, and services provided by these institutions can be classified into four groups:

Granting loans;

- Issue guarantees on loans;
- Providing technical assistance through specialized instruments: ELENA, JASPERS, JESSICA;
- Financing through venture capital funds and instruments: EIF, JEREMIE, JASMINE

Top credit rating (AAA) allows the European Investment Bank to provide funds at favorable terms. The EIB operates according to non-profit principles, and loaners can expect a low cost of capital and long term loan with the option of deferred payment. There are several types of loans:

- Individual
- Indirect
- Group

Individual loan directly related to the financing of the project through the EIB and the value of the investment must exceed €25 million. The funding is directed towards infrastructure investments in transport, energy, environment, industry, services, health and education. There is no restriction on credit, however standard EIB funding goes up to 50% of the investment. The repayment period depends on the type of investments, ranging from 5 to 12 years for industrial projects, and 15-25 years for investments in infrastructure and energy. Interest rates may be fixed or variable, with the possibility of deferred payment of principal amount. This type of loan requires security in the form of bank guarantee or other collateral premium.

Indirect loan involves partner bank mediation in the country of the investor. The loan amount ranges from €40,000 to 25 million, or 100% of the investment value. Projects funded include investments in industry and services, upgrading technologies, energy saving, environmental protection and infrastructure improvements. Investors are mainly small and medium enterprises and local governments.

In cases where investors cannot meet the requirement of a minimum amount of investment of 25 million, there is a possibility of grouping a number of individual projects, and group loans.

When applying for a project loan from the EIB, there is no standard documentation or questionnaire to be filled. However, for each project, it is necessary to develop the feasibility study, provide the necessary legal permits, specify the detailed technical specifications of the project, relevant data about the investor, create a spending plan and conduct financial analysis and assessment procedures of environmental impact. Also, there is the possibility of combining the EIB loan with funds received from the pre-accession funds. The most important projects in Montenegro, financed by the European Investment Bank by the end of 2009 were related to the reconstruction of roads and

bridges and support to the first phase of establishing a national system of waste management. The funding was €57 million.

The role of the EIB in the field of energy efficiency and renewable energy has particularly intensified the last few years when a significant increase in investment in this sector was reported. In 2009, the EIB has invested €25 million in setting up a new fund that specializes in energy efficiency and renewable energy projects.

10.9.6.1. European Local Energy Assistance (ELENA)

ELENA technical assistance service has been launched in cooperation between the European Commission and the European Investment Bank in late 2009. The main source of funding for ELENA is the Intelligent Energy Europe (IEE). Technical assistance will be available to cities and regions in the development of energy efficiency projects and providing additional investments, including all kinds of technical support required for the preparation, implementation and financing of the investment program.

European Commission has predicted the funds in the amount of €15 million for program beneficiaries who are in line with the overall EU energy goals. The decisive criterion for the selection of these projects is their impact on the overall reduction of CO_2 emissions, and eligible projects include the construction of energy-efficient heating and cooling systems, investments in cleaner public transport, sustainable construction and other. The Capital City of Podgorica became a full beneficiary of such funds by signing the Covenant of Mayors.

10.9.6.2. Joint European Support for Sustainable Investment in City Areas (JESSICA)

JESSICA is an initiative of the European Commission for Sustainable Development and renewal of urban areas, planned for the period of 2007 – 2013. This initiative is being implemented in collaboration with the European Investment Bank, the Development Bank of the Council of Europe and commercial banks. This initiative supports governing bodies in the Member States to invest its resources from the Structural Funds (ERDF mostly) in so-called Urban Development Fund, which should function as a revolving fund, i.e. continuous source of funds with instruments (guarantees, loans, profit shares) for commercial banks to provide loans to the end users. Beneficiaries of loans include local and regional governments, agencies, public administration, as well as private investors.

The objectives of the initiative include:

- Securing investment for the reconstruction of cities and development projects in the regions of the EU
- More flexible and easier management of urban funds
- Easier to obtain additional funds from the EIB, CEB and other banks
- Development of banking products for financing the reconstruction of city buildings

For each member country that shows interest in establishing such a fund, a separate study is conducted which then determines the characteristics of the future fund and financing instruments. By joining the EU and signing of a memorandum, Montenegro will also be eligible to participate in this program.

10.9.6.3. Joint Assistance to Support Projects in European Regions (JASPERS)

JASPERS initiative was created in 2006 by the European Commission, the EBRD and the EIB, in cooperation with the German Kreditanstalt für Wiederaufbau (KfW) Development Bank as a form of technical assistance in the preparation of projects eligible for some of the EU funds. The initiative is mainly focused on the countries that joined the EU after 2004 and refers to the period from 2007 to 2013.

Areas that offer technical assistance include:

- Improvement of transport infrastructure within and outside the Trans-European Networks: rail, road and river traffic
- Intermodal transport systems and their interoperability
- Clean urban and public transport
- Environmental projects, energy efficiency and use of renewable energy sources;
- Public-private partnerships

JASPERS program is implemented by highly qualified specialists, based in Luxembourg and in the regional offices of Central and Eastern Europe. This program does not involve financial support, but free technical assistance to national implementing bodies involved in the preparation of major projects. JASPERS is being developed in the form of an annual action plan in cooperation with interested Member States and the European Commission. The focus is on projects with a value exceeding €25 million, for the environment protection and €50 million for transport infrastructure projects.

10.9.6.4. Joint European Resources for Micro to Medium Enterprises (JEREMIE)

JEREMIE initiative was launched as a result of analysis on the size of companies in the EU countries. This analysis established that 91.5% of all enterprises have up to 9 employees and that there is a clear correlation between the growth of loans in these relatively high-risk subjects and economic growth. It is because of this risk that small businesses are facing the greatest obstacles to the obtaining funds in the market. The project is the result of cooperation between the EIB, the EIF (European Investment Fund) and the ERDF and aims to provide favorable conditions for financing small businesses, technical assistance, subsidies or guarantees for loans.

The model is carried out in several stages: in the initial stage, the EIF and the European Commission are raising funds and collaborating with the governments of member states which applied for JEREMIE program, and then conduct financial market analysis that seeks to determine the gap between supply and demand for loans to small and medium entrepreneurs. Based on the analysis, which will be available to all interested parties, action plan is prepared to reduce the gap. The analysis and plan development are funded by the EIF and the ERDF. The European Commission, in cooperation with

representatives of the Member States defines the operational program, which sets out concrete measures and sources of subsidy. Member states are responsible for implementing programs and projects as well as the establishment of a fund managed by a manager appointed by the government of a specific country.

The Fund collects the finances from the ERDF funds intended for Member States and converts it into financial products. Beneficiaries can be enterprises with up to 250 employees and an annual turnover of less than €50 million. The purpose of the use of the funds is not strictly defined and may include projects in agriculture, industry, services, environmental protection, and the establishment of new and modernization of existing enterprises. Implementation of the initiative is expected in the period 2007 to 2013.

10.9.7. Green for Growth Fund – Southeast Europe

The European Investment Bank and the German KfW Development Bank established with the support of the European Commission, Green for Growth Fund - East Europe at a meeting in Istanbul on 25/12/2009. The main objective of the Fund, which was established as a public-private partnership, based in Luxembourg, is to encourage the development of financial markets intended for providing loans to projects in the field of energy efficiency and renewable energy sources. The Fund is focused on the region of Southeast Europe and Turkey.

Green for Growth Fund - Southeast Europe is intended for investors from the public and private sectors, of which the most important so far being the EBRD, the European Investment Fund and Sal. Oppenheim. The initial budget is €95 million, with the aim to increase it to €400 million in the next five years. Austrian Development Bank will provide grant assistance of €5 million and the necessary technical assistance to financial institutions. Services provided by the Fund include medium-and long-term loans, issuing guarantees, debt securities and letters of credit). Projects eligible for funding must guarantee a reduction of energy consumption and CO_2 emissions by 20%. Beneficiaries of funds may come from the public and private sectors, and funding is carried out directly or through partner banks. The range of loans to customers in the public sector costs of € 100,000-10,000,000, where the interest rates are market-formed.

10.9.8. Central European Initiative (CEI)

CEI is the oldest regional initiative in Central and Eastern Europe. It was established in 1989 and today it has 18 member states: Albania, Austria, Belarus, Bosnia and Herzegovina, Bulgaria, Montenegro, Czech Republic, Croatia, Italy, Hungary, Macedonia, Moldova, Poland, Romania, Slovakia, Slovenia, Serbia and Ukraine.

The main goals of the CEI is to improve cooperation between the countries of Central, Eastern and South Eastern Europe, to assist the states in their transition to stable democracy and a market economy, and to assist the candidate countries in the preparation process for membership in the European Union (EU).

One-year presidency of the CEI (from January 1 to December 31) is done on a rotating basis in alphabetical order of the English alphabet of the name of the Member States. The chairman in 2010 year was Montenegro and then Serbia takes over.

Projects supported under the Initiative are grouped under three programs:

- CEI Co – operation Found
- CEI Climate Fund
- CEI Trust Fund

CEI Cooperation Fund

To facilitate the implementation of programs and projects sponsored or organized by CEI, Ministries of Foreign Affairs at their meeting held in Milan in June 2001 decided to establish a fund for the CEI cooperation. The annual budget of € 300,000 has been approved, filled in by the annual contributions of CEI Member States according to their national income. One of the areas of support is the climate and environment protection and sustainable energy. CEI Member States Government and non-governmental organizations have the right to apply for available funds. CEI Cooperation Fund co-financed activities in various areas, provided that at least 50% of the resources was obtained from other donors, and that at least 1/3 of the CEI states are involved.

CEI Climate Fund

The aim of the Fund is to promote projects in the area of climate and environment protection in CEI member states which are not members of the European Union. Available funds will be used for projects in the area of climate and environment protection, for the benefit of CEI non-EU countries: Albania, Belarus, Bosnia and Herzegovina, Croatia, Macedonia, Moldova, Montenegro, Serbia and Ukraine.

Particular, it will support activities in order to:

- Increase energy efficiency
- Promote and disseminate clean technologies
- Research and development in the field of renewable energy sources
- Economic viability of new technologies for the use of sustainable energy
- Support the transition of persons and goods transportation to energy efficient modes of transport
- Remediation of environmental problems
- Waste Management
- Supply of drinking water, water management
- Raise awareness for achieving these goals in terms of training and education measures

All the bodies from the private and public sectors, NGOs from the CEI member states have the right to apply for funds. CEI Climate Fund contribution cannot exceed €400,000.

10.9.9. European Union structural instruments

The EU structural instruments are in the service of the Cohesion Policy of the European Union. The main objective of structural instruments is to support the balanced development of the EU, to reduce the gap between regions and establishment of economic and social balance between EU member states. In the pre-accession period, the candidate countries are prepared for management and the use of structural funds through IPA.

1. Funds that are financed through EU Cohesion Policy are:
2. European Social Fund, ESF
3. European Fund for Regional Development, ERDF
4. Cohesion Fund, CF

The Structural Funds are available to EU member states that have the need for additional investment in a balanced and sustainable economic and social development. Montenegro will be entitled to these funds after its accession to the EU.

EU Cohesion Policy represents about the third of the total EU budget expenditure (35.7%) and it is the second largest budget item for the period 2007 - 2013, with total value of € 347.41 billion.

The entire European Union is covered by one or more of the objectives of the Cohesion policy. To determine the geographic classification, the European Commission uses statistics and classification called Nomenclature of Territorial Units for Statistics (NUTS), according to which Europe is divided into regions.

European Social Fund (ESF)

The European Social Fund (European Social Fund - ESF) supports assistance in training and employment. The most important areas the Fund is focused on are fighting long-term unemployment and exclusion from the labour market, job creation, education and training, as well as equal opportunities for women and men in the labour market.

European Regional Development Fund (ERDF)

The European Regional Development Fund (European Regional Development Fund - ERDF) is intended for the development of social and economic cohesion in the EU in order to reduce the differences in socio-economic development of the region. The funds are mainly used to improve the infrastructure, support local development and environmental protection. The Fund provides support to small and medium-sized enterprises, manufacturing investments, improving infrastructure and local development, investments in education and health in the region.

Cohesion Fund (CF)

The Cohesion Fund is a mechanism established in 1993 and aims to finance large infrastructure projects in the EU in the field of transport and environment protection.

Financial perspective 2007 - 2013 for this fund for implementation of activities is around €70 billion. The ratio between environmental projects and transport must be in proportion, and the beneficiaries exclusively come from the public sector. The minimum value of the project is €25 million, while EU co-financing can reach a maximum of 85% of the investment. The Fund is available only to member states whose GDP per capita is less than 90% of the EU average. With the ERDF, Cohesion Fund is the most important source of funding for national infrastructure projects.

11. Legislative framework for the SEAP Podgorica implementation

One of the important prerequisites for successful implementation of the Sustainable Energy Action Plan of Podgorica is its full compliance with the relevant national legislation, but also with all applicable, official documents of the Capital City of Podgorica.

11.1. Relevant European Union regulations and documents

The main legislative documents regulating the development of the energy sector in the European Union in chronological order:

- *White Paper on an Energy Policy for the European Union, January 1996)*
- *Energy for the Future: Renewable Sources of Energy, White Paper for a Community Strategy and Action, November 1997*
- *Green Paper „Towards a European Strategy for the Security of Energy Supply“, November 2000*
- *Green Paper on Energy Efficiency or Doing More with Less, June 2005*
- *Green Paper on an European Strategy for Sustainable, Competitive and Secure Energy Supply, March 2006*
- *Action plan for Energy Efficiency: Realizing the potential - Saving 20% by 2020, October 2006*
- *The proposal for European Energy Policy, January 2007*

Proposal of the European energy policy sets 4 main requirements by 2020:

- *Reduction of greenhouse gas emissions from developed countries by 20%;*
- *Increase of energy efficiency by 20%;*
- *Increase of the share of renewable energy sources to 20%;*
- *Increase of the share of biofuels in transport to 10%.*

Based on the provisions of the main EU legislative documents, the area of renewable energy is regulated by the following directives:

- *Directive 2001/77/EC on the promotion of the electricity produced from renewable energy source in the international electricity market, September 2001*
- *Communication on Alternative fuels for Road Transportation and on a Set of Measures to Promote the Use of Biofuels, November 2001*
- *Directive 2003/30/EC on Promotion of the Use of Biofuels for Transport, May 2003*

- *Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC*

European Union Directives directly or indirectly regulating the area of energy efficiency are:

- *Directive 92/75/ECC on the indication by labeling and standard product information of the consumption of energy and other resources by household appliances*
- *Directive 93/76/EEC to limit carbon dioxide emissions by improving energy efficiency (SAVE)*
- *Directive 2002/91/EC on the energy performance of buildings*
- *Directive 2003/87/EC for establishing a scheme for greenhouse gas emission allowance trading within the Community*
- *Directive 2004/8/EC on the promotion of cogeneration based on a useful heat demand in the internal energy market*
- *Directive 2004/101/EC for establishing a scheme for greenhouse gas emission allowance trading within the Community, in respect of the Kyoto Protocol's project mechanisms*
- *Directive 2006/32/EC on energy end-use efficiency and energy services*

11.2. Strategic documents of Montenegro

11.2.1. Energy Policy of Montenegro

Realizing the importance and the complexity of energy management, the Montenegrin Government adopted a series of policy documents and legislation that defined the future course of action in this field.

Energy policy was adopted in 2005. This policy defines the objectives and instruments which should help the Government of Montenegro develop energy sector: a secure and reliable energy supply, environmental protection, property rights, market economy, investment, energy efficiency, new and renewable sources, networking between the regions and beyond, social protection measures and other. In line with the economic development of Montenegro and energy practices and standards for EU accession candidate countries; this Energy Policy particularly emphasizes the need for the establishment of an appropriate legal, institutional, financial and regulatory framework necessary for the sustainable development of the energy sector.

Identified energy policy objectives are:

1. High quality, reliable and diverse supply of energy in order to balance supply with the demands diversified according to all forms of energy,

2. Maintenance, rehabilitation and modernization of existing and construction of the new reliable infrastructure for energy production and use

3. The reduction of import dependence, primarily through the creation of stable conditions for investment in research and construction of new energy sources (especially on the untapped hydropower in unused facilities) and investment in other energy infrastructure

4. Creation of appropriate legislative, institutional, financial and regulatory frameworks to encourage private sector participation and investment in all aspects of energy infrastructure

5. Creation of conditions for greater use of renewable energy sources combined electrical and thermal energy (CHP) and the use of fossil fuels with clean technologies

6. Establishment of a competitive market for the provision of energy in areas where there is that possibility (generation and supply) in accordance with the concept of a regional energy market, with regulated monopoly network activities

7. Provision of institutional and financial incentives for improving energy efficiency and reducing energy intensity in all sectors, from production to consumption

8. Sustainable production and use of energy in relation to environmental protection and international cooperation in this field, especially the reduction of greenhouse gas (GHG) emissions

9. Support to research, development and promotion of new, clean and efficient energy technologies and energy management policies in professional and scientific grounds.

The main instruments for policy implementation are divided into four groups: ***systemic*** (e.g. providing incentives for the implementation of energy efficiency programs, new renewable energy sources and clean technologies, including the use of energy-efficient appliances acceptable for the environment protection), ***legislative*** (e.g. the review of existing and adoption of new laws, regulations and technical standards in the field of energy building and other objects, and in particular to increase energy efficiency), ***institutional and organizational*** (e.g. training the Energy Efficiency Unit to successfully promote the implementation of the Government's energy efficiency programs, including proposition of adequate legislation for its encouragement) and ***economic and social instruments.***

11.2.2. Energy Development Strategy until 2025

Energy Development Strategy until 2025 was adopted in December 2007. The strategy has energy, environmental, economic, legislative, organizational, institutional and educational dimensions. It covers the period until 2025 during which there will be a succession of existing and future technologies, including changes in the diversity and resources and energy management. It provides legal, economic, organizational,

institutional, informational, educational, and promotional measures for its implementation.

Strategy is a starting point for a European model of sustainable and strategic development of the energy sector, for the adoption of legislation and other institutional support to successful implementation of its own energy policy in the course of integration into European and wider international framework. It is certainly a base for the Government of Montenegro and other government institutions in development of other energy program documents in the field.

Strategy, as one of the highest state regulations within Montenegro, has the key development dimension in defining the spatial development, providing conditions for sustainable development of the ecological state. It also has important energetic and economical as important components of GDP growth, and in the inevitable process of constructive communication between all segments of the Montenegrin society.

The main strategic orientations can be defined by:

- The strategy based on the adopted Energy Policy (2005), the existing international obligations of Montenegro and the EU Energy Policy Guidelines;
- Montenegro's acceptance of obligations coming out of the as the key document for the implementation of reforms in the energy sector - the directions, rules and measures of (re)organization of the electricity sector and the gas sector and market development of these energy sources;
- Implementing all necessary measures for the successful implementation of the *Acquis Communautaire* for energy, environment protection, competition and renewable energy sources according to the demands and dynamics of the Energy Community Treaty;
- Recognizing energy as a pillar of the overall energy, sustainable and long-term stable growth of Montenegro, with the positive macroeconomic effects;
- Improvement of energy efficiency in production and consumption to the level of moderately developed countries in the EU;
- Safe, secure, reliable and quality energy supply to consumers at realistic prices;
- Taking decisive action to maintain at least a 20% share of renewable energy in total primary energy consumption in Montenegro;
- Rational and wise use of the hydropower potential of the river basins Morača, Zeta, Lim, Piva, Tara, Ibra and Ćehotina in full compliance with the applicable declaration of UNESCO, the decision of the Parliament and the principles of sustainable development;
- Relying on the use of domestic coal reserves as the second most important energy resource of the state in addition to hydropower; construction of Power Plant Pljevlja 2 and the heating system in the town of Pljevlja. Also, there is the possibility of construction of Power Plant Berane if the investment proves to be economically viable;
- Rehabilitation and technological modernization of existing production, transmission and distribution system;

- Improvement of efficiency and reduction of the impact of coal mining and power plants on the environment;
- Reduction of energy dependency (reduction on importing energy) and improvement supply security of Montenegro;
- Support the development and accelerate the introduction of renewable energy sources, the use of solar energy for thermal energy, replacing industrial and small cogeneration boiler on liquid petroleum gas (LPG) and liquid fuels, the introduction of other local energy systems in the state energy system;
- Development of the strategic use of LPG as a precedent to natural gas,
- The development of the natural gas system (including the construction of regional gas terminals for receiving liquefied natural gas and machines for the use of natural gas);
- The realization of the strategic 90-day supplies of petroleum products according to the EU directive;
- The implementation of regulatory, legislative, and operational involvement in the process of accession to the EU in the field of energy and environment, including the integration of energy markets in Southeast Europe and the EU;
- Continued exploration of oil and gas on the Montenegrin coast, coal in Pljevlja and Berane basin and studies on the use of the remaining hydro potential;
- Improvement of regulatory process and the professional independence of the regulatory body, in accordance with the energy policy of the Government of Montenegro;
- Reaching agreement with neighbouring countries (Bosnia and Herzegovina, Croatia, Serbia and Albania) on the optimal use of the joint hydropower and water use and management, and the design of new power lines for interconnection relationship with these countries;
- Active involvement of Montenegrin institutions in international cooperation in energy research and development, and the introduction of energy system into the school system at all levels of education;
- Continued reform of the energy sector in accordance with the adopted Energy Policy of Montenegro and guidelines for the development of the energy sector of the European Union, in order to create conditions for a safe, secure, reliable and quality supply of consumers at competitive prices, respecting the principles of sustainable development and market operations;
- Continued restructuring Electric Power Company of Montenegro AD Niksic, development of plans for the development and privatization of the company;
- Creation of the conditions for active energy policy, establishment and implementation a system for tracking data on production, consumption and energy losses, according to Eurostat system of national energy data;
- Providing opportunities and support to foreign investors for the implementation so called Clean Development Mechanism (CDM);
- Provision of social protection in the changes energy sector that may affect the social status of certain segments of society.

The Development strategy for Montenegrin legislation is in line with the regulations of the European Union (EU) and implies respect for the dynamics and deadlines for the

implementation of EU directives stated in the Energy Community Treaty (2005). The Agreement came into force on 1 July 2006 and was ratified by the Montenegrin parliament on 26th October 2006 meaning that Montenegro accepted short-term, medium and long-term tasks and deadlines to meet obligations under the Agreement. The key tasks are: (I) the implementation of the *Acquis Communautaire* for energy, environment, competition and renewable energy sources, (II) the adoption of development plans for the implementation of "generally applicable standards of the European Union" in the electricity and gas, and (III) the adoption of the statement of "security of supply", which explains the diversity of supply, technological security, geographic origin of imported fuels and other elements.

When it comes to the specific activities, Montenegro agrees with the accepted proposal of the European Commission (in 2007), to fulfill the following targets in EU member states by 2020:

- Reduce greenhouse gas emissions by 20%;
- Dramatically increase energy efficiency and reduce energy consumption by at least 20%;
- Increase the share of renewable energy to 20% of total primary energy consumption;
- Increase the proportion of biodiesel fuel to at least 10%.

Taking into account the EU's strategy for the promotion of cogeneration and removing barriers to its development defined as the most appropriate cogeneration technology for efficient use of traditional fossil fuels and reduction of greenhouse gas emissions with greenhouse effect, Montenegro planned industrial cogeneration (for larger customers who have continuous thermal load) and small cogeneration in the service sector (hospitals, hotels, shopping centres, craft stores) and large residential blocks. Accordingly, it is anticipated that the fuel for cogeneration is LPG and liquid fuels if no natural gas.

The plan is to replace part of the industrial boilers or coal liquid fuels by 2025 with industrial cogeneration plants using liquefied petroleum gas (LPG) and liquid fuels.

In this section, the emphasis is on the development of strategy and supply of heating and development of local energy strategy.

When it comes to the supply of liquid fuels it is expected to meet requirements for storage facilities to keep mandatory ninety-day reserves of petroleum products in accordance with the Directive 98/93/EC and according to scenarios of the final consumption of petroleum products by 2025. It also points to research on the existence of certain offshore oil reserves and the related issues of adequate fuel supplies.

From 2000 to 2004, Montenegro produced in its territory around 59% of primary energy from renewable energy sources, out of which 55% goes out to hydro energy and 4% from firewood, which is far above the EU average.

Renewable energy sources have been identified through the use of hydropower construction of small hydro power plants, wind and solar energy, biomass, crop residues, and municipal waste. According to the Strategy, the plan is to use renewable energy sources at least at the amount of 20% of total primary energy consumption by 2020.

A special part of the Strategy addresses the balance of power by 2025 in regard to projections of production and consumption.

The Strategy is essentially linked with the processes of environmental protection in all phases of the project (preparation, design, and implementation during the exploitation). It implies active participation of stakeholders in the process of project preparation for the implementation (studies, permits, UNESCO approvals, etc.), and in the process of construction of energy facilities.

The impact of energy on the environment is seen in the Strategy through the prism of emission of harmful substances into the environment, which primarily occur as a result of fossil fuel in the existing power plant (TPP) in the process of transformation of the heat energy of the fuel burn in the existing power plant (PP). Substances released as a result of the processes in PP have negative impact on the environment in two ways:

- Deterioration of air quality (SO_2 emission, NOx, dust, CO, mercury ...)
- Disruption of the global climate on earth due to greenhouse gases (CO_2, CH_4, N_2O...)

In terms of environmental impact, in the case of new hydropower plants construction and associated reservoirs, it is necessary to prepare a detailed documentation in accordance with applicable solutions that will provide assessment of the impact of hydropower on the environment, space and natural resources. In this sense, it is necessary to explore the possibility of exploiting multi-purpose hydropower to supply drinking water, development of tourism and fish farming, irrigation, agricultural areas, etc.., It is particularity necessary to take into account UNESCO Declaration on the protection of Tara River and other domestic and international documents.

Energy infrastructure requires space for its development. Montenegro is not densely populated, has a rich and relatively well-preserved cultural heritage, a very high level of biodiversity, and more pristine areas, so in that sense it is necessary to synchronize and provide conditions for the development options in accordance with an environmentally acceptable conditions and the use of space.

The strategy presents a road, the necessary measures and steps (so-called "roadmap") which will be implemented by Montenegro as part of the adopted long-term Energy Policy. However, in order to fully ensure the implementation of the Strategy, the Action Plan is designed to maintain the current dynamics of the target.

The Action Plan is essentially an integral part of the Strategy and is a concrete strategic perception of energy development. It should consist of a series of specific programs and projects through which the Strategy goals will be accomplished, and adequate control

mechanism for monitoring and corrective actions. The Action plan defines specific tasks for the strategy for at least first five years of implementation, along with a description of relevant programs and projects, the division of tasks between local institutions, costs, dynamics and funding of the activities and point to specific measures (critical paths) required for their implementation.

Framework for Energy Efficiency:

- The adoption of a special law on energy efficiency. The law will, among other things, decide on establishment of a central institution for energy efficiency, which will play a leading role in promoting energy efficiency and Energy Efficiency Fund. The law will also copy the main provisions of the EU Directive 2006/32/EC on end-use energy efficiency and energy services and introduce the concepts of other relevant directives
- Establishment/strengthening and capacity development of central institutions for energy efficiency and the establishment of the Energy Efficiency Fund
- Revision of the Energy Efficiency Strategy of Montenegro based on the adopted Strategy and in accordance with the development in the field of energy efficiency in Montenegro and the EU
- Establishment of statistical and information systems for energy efficiency, which would allow planning and monitoring and constitute a means for adequate reporting
- Thorough analysis of the total losses in the energy sector in Montenegro and conduction of the specialized expert studies and/or a number of specific sectoral and technological studies for energy efficiency, in order to identify potential energy efficiency and design of appropriate measures
- Gradual development of all legislative, regulatory and institutional framework for energy efficiency based on the relevant EU directives and standards, and the establishment of mechanisms for proper application and implementation,
- Improving international cooperation in the field of energy efficiency,
- Promotion of applied research and development and transfer of knowledge in the field of energy efficiency and the development of local production of energy-efficient equipment and materials.

Energy efficiency in the buildings construction sector:

- The introduction of urgent measures for the implementation of the existing regulations for thermal insulation, with a parallel PR and information campaign to potential owners and tenants, in order to create demand in the market and put pressure on market players to practice appropriate construction of energy efficient buildings and systems,
- Introduce the concept of energy efficiency and provisions in the Law on Construction,
- The development of a new regulatory framework introducing the concept of the general requirements for achieving buildings energy performance, and in the next phase the introduction of energy certification of buildings, in accordance with Directive 2002/91/EC on the energy characteristics of buildings,

- The introduction of energy labeling scheme and minimum energy efficiency requirements related to consumer devices and equipment
- Regulations for the introduction of individual metering and billing of energy costs according to the actual consumption.
- Measures to promote the use of low-energy buildings and sustainable sources of energy in buildings (especially active and passive solar systems).

Energy efficiency in the public sector:

- Introduction of energy management schemes and drawing up plans for energy efficiency at the local level and in public facilities, in combination with training and pilot projects and establishment of a centralized "monitoring and benchmarking" scheme
- Investment and the introduction of a grant scheme for energy efficiency for the broader public sector
- Regulatory introduction of energy efficiency criteria in public procurement,
- Regulatory and other measures to facilitate alternative financing mechanisms in the public sector (energy performance contracting, "Third Party Financing", and others.)
- Certification of energy performance of public buildings.

Energy efficiency in transport

- Measures to promote energy efficiency in transport: drivers training, efficient vehicle maintenance, schemes for fleet management in the public transport and organization and management of a large number of vehicles
- A public campaign to raise awareness of the general supply/use of energy efficient vehicles/alternative fuels vehicles, efficient maintenance of vehicles and driving with a low level of consumption

11.2.3. Energy Efficiency Strategy of Montenegro

Energy Efficiency Strategy was adopted in October 2005. The Strategy is the framework for initiatives necessary for the promotion of energy efficiency in all energy sectors in Montenegro, especially in the field of final energy consumption, including initiatives to increase the use of alternative and renewable energy sources.

The main objective of Montenegro Energy Efficiency Strategy is to highlight the contribution of rational use of energy, ensuring adequate supply, market competitiveness and environmental protection and to confirm the important role of energy efficiency in the creation of new business opportunities, increase of employment and improvement of living standards, as well as other benefits to regional and global levels.

The EE strategy will include actions to be taken by the Government and energy companies - manufacturers, suppliers and consumers of energy in order to promote and develop efficient use of energy, renewable energy and related technologies.

The benefits of increasing energy efficiency in the company:

- Rational use of natural resources,

- Reduction of energy dependence,

- Reduction of the need to build new power plants and

- Reduction of harmful effects on the environment.

Benefit to individual consumer is primarily in:

- Reduction of energy costs and

- Optimal use of energy devices.

The requirement for achieving the goals of energy efficiency is the design and gradual implementation of institutional, legislative, structural, organizational and financial-economic reforms in relevant sectors of the national energy supply.

Taking into account international standards, the Energy Efficiency Strategy has set general objectives relating to security of supply, market competitiveness and environmental protection.

In the above context, the specific objectives of the Energy Efficiency Strategy are:

- Significant reduction of irrational energy consumption in all energy sectors,

- Reduction of the negative impact of energy use on the environment,

- Reduction of costs and dependence on energy imports and reduction of the international trade deficit,

- Reduction of household energy costs and improvement of comfort, health and safety of the population, taking a significant role in improving the situation of the poorest,

- Reduction of the cost of energy in commercial sector and industry and increase their competitiveness and reduce high energy intensity per industry,

- Reducing energy costs in the public sector and hence a reduction in public expenditure

- Improvement of the reliability of the power system, i.e. reducing power outages and losses in transmission and distribution,

- Reduction of the cost of energy production, transmission and distribution of electricity

- Initiation of local activity and employment through the construction of small power plants and other renewable energy plants and local companies to manufacture, maintenance of energy efficiency equipment, and conduct all services related to energy efficiency,

- Improvement of international connections through participation in activities related to reduced emissions.

The strategy provides an overview of the level of use of natural energy resources (hydropower and coal) which are at an unsatisfactory level, and at the same time takes into account the results obtained by processing trends of energy consumption in the past (the increase in the share of electricity to 51.6 % in 2004 due to its transformation into heat energy and reduction of the rationality of the total energy system). Assessment of future trends (2010) indicates increased dependence on imports.

There is a series of identified irrationalities in the chapter dealing with potential energy efficiency and renewable energy sources, the assessment of the overall system of the use of primary sources, plants for production, transmission and distribution of energy to the transformation and its use by end users which are the consequence of:

- The absence of a long term energy strategy,

- Orientation towards energy intensive and often outdated technologies and equipment,

- Inadequate engagement and maintenance of facilities,

- Lack of technical education for energy users,

- Negligent and unprofessional in operations,

- Lack of knowledge and motives for rational use of energy

- Wrong policy related to energy prices

Abnormally large and wasteful energy consumption is best illustrated by the following indicators: energy consumption per capita, energy consumption per unit of gross domestic product (intensity factor), per share of energy costs in the total product of society as a whole and by sector, especially in energy-intensive industries.

According to the Strategy, the stated indicators of energy consumption were so exacerbated during the period after 1990 that macro and micro economic analysis indicate that the planned commercial and economic recovery of Montenegro till 2010 can only be achieved provided that the above indicators of energy consumption at least reach a level of 1990. In this sense, the Strategy develops technical, economic and market potential, and reviews manufacturing sector (small hydro plants, wind, solar, biomass, municipal waste), consumer sector (industry, transportation, housing, etc.). It examines the assumptions and possible technical solutions, such as isolation, introduction of heat pumps, "cooling" energy accumulators, regulatory system of consumption, etc.

It is interesting to review the electricity consumption for heating in local governments, the data for the Capital City of Podgorica show an increase in spending by 9% in 2001 (364.571 GWh) compared to 1996 (333.5 GWh).

The Strategy has identified the following categories as target groups interested in improving energy efficiency:

- Government institutions,
- Intermediaries,
- Consumer groups.

Accordingly, the activities are designed for specific categories and their role as participants and beneficiaries of EE Strategy. Thus, these municipalities are designated and their activities are: decision-making on municipal infrastructure, public and administrative buildings; planning and implementation of EE in the structure of supply, supervision and implementation of standards for insulation/ energy performance of buildings, increasing the awareness of the population. Municipalities, having in mind their roles as actors in the implementation of the Strategy should provide support to energy efficiency projects; support the development of local consensus for major infrastructure investments and local energy efficiency policy; planning/control traffic flow and public transport; studies on increasing the level of public awareness. When it comes to the role of municipalities as users of the Strategy, it is reflected in the use of the Strategy for finding effective strategies for local energy supply (gas); support to local energy efficiency initiatives, pilot projects, support to energy saving and environmental protection; energy preservation in their own premises/public buildings.

Barriers coming from political, legal and regulatory framework;

- The institutional framework;
- Fiscal, tax and pricing policies;
- Access to financial funds;
- Information and publicity
- Barriers to the development of RE resources

The above barriers are specified in four main areas:

- System policy in energy efficiency
- Energy efficiency in buildings
- Energy efficiency in industry
- Energy efficiency in transport

Adequate goals and actions that transcend the barriers identified were given.

A separate chapter of the Strategy deals with the previous and existing energy efficiency programs and projects in Montenegro and new policies as a necessity based on the analysis of the needs and responsibilities, especially in the area of defining the priorities and actions across sectors. As a prerequisite to implementation of the goals, the Strategy emphasizes the necessity to establish units for energy efficiency, which will have a clearly defined institutional framework. Also, there is a need for additional

research, studies, data collection and market analysis, types of financing, and general economic and market potentials.

Integral part of the Strategy are annexes designed by different subjects.

11.2.4. EE Strategy Action Plan 2008 – 2012

In accordance with the obligations set in Energy Efficiency Strategy, the Action Plan was adopted to implement the Strategy for the period 2008 - 2012 and shall be based on:

- Guidelines Energy Efficiency Strategy and the Energy Development Strategy of Montenegro by 2025;
- The need to be closer to European Union legislation ("EU Acquis") in the field of energy;
- Progress and lessons learned during the implementation of activities envisaged energy efficiency action plans for 2006 and 2007
- The results of the technical assistance project MEEU;
- Plans of international donor support for energy efficiency;
- Previous experiences MEEU related to current issues in the energy sector of Montenegro.

The content includes an overview of the current situation in the field of energy efficiency, overview of requirements in this area in the context of Montenegro accession to the EU and participation in the Energy Charter Treaty (EU policies and legislation, the EU Action Plan for Energy Efficiency, etc.), concepts and priorities and recommendations for implementation.

According to the Action Plan, there are three main lines of action that should be developed in parallel, and they are related to:

1. Establishment of basic framework for energy efficiency (EE Act, the central institution for EE and Energy Efficiency Fund), including the gradual development of a legislative and institutional framework for EE;

2. Implementation of sector programs for EE, including the provision of incentives, technical support and promotion/marketing activities;

3. Promotion of investments in EE, mobilizing international financial assistance, state and local funds and private equity.

The Plan has identified areas for EE activities primarily focusing on different sectors and at the same time identifying the right priorities.

11.2.5. National Sustainable Development Strategy (NSDS)

National Sustainable Development Strategy (NSDS) was adopted in 2007 and represents a strategic document of future development. Concerning energy sector the NSDS has identified a number of problems in this sector. Thus, inter alia, it has pointed to the problem of low levels of EE as a result of non-economic costs, outdated and energy inefficient technologies and equipment. In support of this it is stated that in Montenegro about 2.1 times more energy per unit of GDP is spent than in developed countries and about 3.3 times more than in the EU. Very high electricity losses during transmission and distribution, which mostly occur as a result of organizational weaknesses (so called commercial losses), and outdated and damped networks and equipment (technical losses) also contribute to the low energy efficiency.

Pursuant to the above mentioned Action Plan for implementation of the NSDS the task of rational energy consumption is specified with increase of energy efficiency by 2010 at least by 10% compared to 2025. Under this activity, reducing technical and commercial losses, promotion and implementation of projects for improving energy efficiency in the public sector, etc. are defined as special measures.

11.2.6. Legislation of Montenegro

With regard to legislation in this field, we shall hereby indicate the following laws:

- Law on Energy Efficiency (Official Gazette of Montenegro, no. 29/10);
- Law on Spatial Development and Construction of Structures (Official Gazette of Montenegro, no. 51/08);
- Law on Environment (Official Gazette of Montenegro, no. 48/08).

Law on Energy Efficiency was adopted in April 2010 and regulates the method for efficient use of energy, measures to improve energy efficiency and other issues important for energy efficiency. This Law does not apply to energy efficiency of facilities for production, transmission and distribution of energy.

According to the Law energy efficiency documents shall include:

- Energy Efficiency Strategy;
- Energy Efficiency Action Plan;
- Annual operational plan for energy efficiency improvement in public administration institutions and
- Energy Efficiency Programs and Plans of the Local Self-Government Units.

Accordingly, local self-government unit shall adopt the Energy Efficiency Improvement Programme which must be in compliance with the Strategy and the Action Plan. This Programme shall be adopted for the period of three years and shall comprise of:

1) proposal of the energy efficiency measures within the jurisdiction of the local self-government unit, especially including:
- plans for refurbishment and maintenance of buildings, used by the local self-government units and authorities, public offices and public companies founded by the local self-governing authority, in order to improve energy efficiency;
- plans for improvement of public utility services (public lighting, water supply, waste management etc.) and transport, aimed at improving energy efficiency;
- specific energy efficiency measures in buildings protected as cultural heritage etc.;
- other energy efficiency measures to be implemented on the territory of that local self-government unit.

2) timeframe and methodology for implementation of the given measures and
3) resources needed for implementation of the Program, as well as the sources and methods for their securing.

Local Self-government Unit shall submit the Energy Efficiency Improvement Program, to the Ministry, with the purpose of assessing its compliance with the Action plan. Consequently, energy efficiency stimulus for the local self-government unit may be provided out of the public budget of Montenegro.

Energy Efficiency Program shall be implemented with the annual Energy Efficiency Improvement Plan of local self-government units. Energy Efficiency Improvement Plan shall contain:
- implementation measures that are planned;
- timeframe and methodology for implementation of the defined measures and
- resources needed for implementation of measures, as well as the sources and methods for their securing.

The Energy Efficiency Improvement Plan will constitute an integral part of the Budget of a local self-government unit. The Report on Implementation of the Energy Efficiency Improvement Plan will be submitted to the Ministry not later than March 1st of the current year, for the previous year.

Obligations of local self-government units are defined as duties of: performing energy management of buildings, or of built structures, used by the local self-governing unit, public offices and public companies founded by the local authority; informing citizens on the possibilities for improving energy efficiency and benefits and effects of the implementation of the energy efficiency measures; determining stimulative measures for improving energy efficiency within its jurisdiction and, establishing and managing information system for monitoring of the energy consumption within its own premises.

In addition to the above this Law specifies obligations of the Ministry and obligations and forms of cooperation between distribution system operator, energy supplier and energy distributor and the Ministry.

A special chapter of the Law refers to energy efficiency measures that relate, inter alia, to introduction of this instrument in public procurement procedures or methods of certification for buildings. Hereof, the Law deals with the issue of energy audits of various structures and establishment of an information system in this field.

In particular, it seems important to indicate provisions of the Law which define that use of renewable energy sources for production of electrical or heat energy shall be regarded, in terms of this Law, as a measure of energy efficiency, if produced electricity is used partially or completely for satisfying the needs of the built structure in which installation (plant) is located and if a specific renewable energy source is not already covered by some of stimulating measures or if the electricity produced from a specific renewable energy source is not intended for sale.

Moreover, the Law deals with issues of energy services, financing and penalty and monitoring provisions.

Law on Spatial Development and Construction of Structures (Official Gazette of Montenegro, no. 51/08) regulates the system of spatial development, the manner and requirements for construction of structures, as well as other issues. Spatial development shall imply adoption of planning documents establishing organization, use and purpose of space, as well as measures and guidelines for development, protection and improvement of space. The Law stipulates that planning documents, inter alia, must include the concept of using renewable energy sources and implementation of energy efficiency measures.

Moreover, the Law defines that urban technical requirements, depending on the type of the structure, include requirements for energy efficiency, while provisions specifying technical regulations, standards and quality norms in the field of construction elaborate requirements for thermal protection, energy consumption and energy efficiency.

Law on Environment (Official Gazette of Montenegro, no. 48/08) regulates principles of environmental protection and sustainable development, entities and instruments of environmental protection, the public participation with regard to environment issues and other issues.

Some of the objectives of environmental protection are specified to be protection of the ozone layer and climate change mitigation, as well as rational use of energy and encouraging the use of renewable energy sources. Furthermore, the Law defines, inter alia, that funds for elaboration, implementation and development of programs, projects and other activities that contribute to conservation, sustainable use, protection and improvement of energy efficiency shall be provided from the Fund for Environmental Protection, which should be established as soon as possible. Concerning obligations of natural and legal entities, pursuant to Article 43 of the Law they will be required to ensure environmental protection while conducting their activities by, inter alia, sustainable use of natural resources, and energy resources; by introducing energy-

efficient technologies and using renewable natural resources; by taking records of consumption of raw materials and energy, release of pollutants and energy and others.

Decree on Limit Values of the Content of Pollutants in Liquid Petroleum Fuels (Official Gazette of Montenegro, no. 39/10) prescribes the types of liquid petroleum fuels, limit values of the content of pollutants and other characteristics of fuels that, in terms of environmental protection, shall be complied with in order to be placed on the local market and the method of defining and monitoring the characteristics of a fuel.

Montenegro has ratified the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) on 27 March 2007 (Law on Ratification, Official Gazette of Montenegro, 17/2007). Montenegro is not on the list of developed countries and/or countries in transition to market economies (Annex 1), and therefore there are no direct obligations for reducing emissions of greenhouse gases, at least not in the first commitment period by 2012.

11.3. Strategic documents of Podgorica

11.3.1. Spatial Plan and Local Environment Protection Plan

Spatial Plan of the Municipality of Titograd (today's Capital City of Podgorica), was adopted in 1990 and deals with issues of development potential and primarily electricity supply. In this sense, development in the field of supply is directed towards the goal of providing basic needs for electricity and reducing energy dependence through rational and efficient use of energy and resources of its own. Decision on elaboration of the new ***Urban Spatial Plan (USP)*** was taken in December 2008 and its elaboration is in progress. The basic orientation of the USP is related to adoption and implementation of sustainability principles in all spheres of development.

Local Environment Protection Plan of the Capital City of Podgorica from 2010 to 2014 was adopted in February 2010 and represents a strategic commitment to sustainable development. The Local Plan recognizes improvement of quality of life, environment, utility services and infrastructure, economic and social development as basic development determinants. In this sense, the importance of ensuring a high level of quality of all segments of the environment and monitoring their condition, increasing awareness of environmental protection and active participation of the public; encouraging energy efficiency and conserving resources, establishing an efficient public transport with the use of environmentally friendly fuels is recognized. Concrete activities planned within the Plan that may be indicated are conducting campaigns for rational use of water, electricity, cars; stimulating the use of solar energy; moving the traffic from Zone I, etc.

11.3.2. Energy and environment protection acts and documents of the Capital City of Podgorica

Relevant official documents of the Capital City of Podgorica whose core determinants are more or less incorporated in this Action Plan are as follows:

- the Letter of Intent for cooperation in the "Capacity Building for Energy Management" Project (April 2009);
- Memorandum of Understanding (October 2009);
- Policy statements on energy management and environmental protection (November 2009);
- Decision on establishment of the Energy Management Office with the Info Centre (November 2009);
- Covenant of Mayors (May 2010);
- Recommendations for design, construction and maintenance of public lighting and traffic lights (November 2008).

Pursuant to Article 66, and in relation to Art. 63, 64 and 65 of the Law on Spatial Development and Construction of Structures and Article 48 of the Statute of the Capital City (Official Gazette of the Republic of Montenegro - municipal regulations, no. 28/06) the Assembly of the Capital City – Podgorica adopted in March 2009 the Decision on compensation for communal services equipping of the construction land (Official Gazette of Montenegro - Municipal Regulations, no. 11/09 and 39/10) establishing the calculation method and amount of compensation for communal services equipping of the buildable land in accordance with the Development Program of the Capital City. With this regard, the compensation established by this Decision shall be reduced by € 120.00 per 1 m^2 of the built in solar collector - panel in structures with solar energy systems used in sanitary water heating, space cooling, or electricity production.

12. Monitoring and control of the Action Plan implementation

All cities signatories to the Covenant of Mayors have an obligation every two years to elaborate and submit to the EC a *Report on the Action Plan Implementation* (hereinafter referred to as: the Report) which should include, along with a detailed description of implemented measures and activities and the results achieved, the CO_2 Monitoring Emission Inventory-MEI. By comparing the CO_2 Baseline Emission Inventory for 2008 (Chapter 6) with the Monitoring Emission Inventory for some of the next few years it will undoubtedly show the actual reduction of CO_2 emissions in the Capital City and will answer the question of whether implementation of the Action Plan is successful or not.

Recommendation of the European Commission is to prepare monitoring CO_2 emissions inventories every two years or even every year. If it is estimated that preparing monitoring CO_2 emissions inventories every 2 years shall be a bit too demanding task, recommendation of the European Commission is to elaborate the Action report for two years alternatively without the CO_2 emissions inventory (2nd, 6th, 10th, 14th year etc.)

and Implementation report with the CO_2 emissions inventory (4th, 8th, 12th, 16th year etc.). The Action and Implementation reports will differ in so far that the first will give qualitative information on the implemented measures and actions, actual energy savings and reductions in CO_2 emissions, while in case of the Implementation report information will be quantitative. Both reports should include an analysis of timeframe and effectiveness of implementation of the identified measures, as well as proposals of corrective measures for those cases where implementation of the measures within the Action Plan proved unfeasible or there have not been expected positive results. With a view to elaborating the report more easily and having the possibility to compare results the European Commission will prepare official templates for both types of reports.

Methodology of elaboration of the Action Plan of the Capital City of Podgorica encompasses the process of control and monitoring its implementation, which should take place simultaneously on several levels:

- Monitoring the timeframe of implementation of the specific energy efficiency measures according to the Plan of Measures and Activities;
- Monitoring effectiveness of implementation of projects according to the Plan;
- Monitoring and control of energy savings goals set for each individual measure within the Plan;
- Monitoring and control of achieved CO_2 emissions reductions for each measure according to the Plan;
- Monitoring and control of achieved of CO_2 emissions reductions by consumption sectors (buildings, transport, and public lighting) with respect to the baseline year 2008;
- Monitoring of the overall achieved CO_2 emissions reductions in the Capital City compared to the baseline year 2008.

Monitoring timeframe and effectiveness of implementation of the Plan of measures and activities will be realized by the Energy Council, which may, if, due to the volume of work, the need arises, establish a working group for monitoring and control of implementation of the Action Plan.

Preparing an efficient methodology for monitoring and control of implementation of the Action Plan of the Capital City is a very complex task. The first step involves determining indicators and parameters to be monitored, as well as the method in which this will be done. The Table 12.1 gives a proposal of indicators in different categories and the method of their control and monitoring according to the recommendations and classification of the European Commission (Chapter 2).

Table 12.1 Proposed process of monitoring and control of implementation of the Action Plan of the Capital City of Podgorica

CATEGORY	INDICATOR	COMPLEXITY OF DATA COLLECTION 1 - SIMPLE 2 – MEDIUM COMPLEXITY	MONITORING METHOD

		3 - COMPLEX	
Transport	Number of passengers in public transport in one year	1	Selection of representative bus lines to be monitored
	Number of kilometers of bicycle paths in the Capital City	1	Municipality
	Number of kilometers of sidewalks in the Capital City	1	Municipality
	Number of vehicles passing a certain measuring point in a year/month (determination of a representative measurement street/ point)	2	Setting a vehicles countdown in selected measuring points (streets)
	Total energy consumption of vehicles owned by the Capital City	1	Exact data from the fuel bill converted to kWh
	Total energy consumption of alternative fuel vehicles in the public transport of passengers	1	Data from the fuel bill converted to kWh.
	% of citizens of the Capital City near and with good access to the city's public transport	3	Conducting surveys of citizens in selected areas of the Capital City
	Average number of kilometers with large daily increased traffic intensity	2	Analysis of higher mobility of traffic in the selected areas of the Capital City
	Annual sales volume of fossil and alternative fuels at selected gas stations in different parts of the Capital City	1	Agreement with the selected gas stations on continuous collection and submission of data
Buildings	Total energy consumption in buildings owned by the Capital City	1	Establishment of an information system for data collection
	Total area of solar collectors installed in the territory of the Capital City of Podgorica	3	Data on allocation of grants and loans for installation of solar collectors Survey research in selected parts of the Capital City
	Total electricity	1	Data from the Electric

	consumption in households		Power Company of Montenegro
Energy companies	Number of companies registered for different energy activities, ESCO companies, manufacturers and distributors of solar equipment, etc. in the territory of the Capital City	2	Register of business entities in the Capital City of Podgorica
Citizens	Number of citizens of the Capital City who visit different energy related events (public forums, workshops, seminars, etc.)	1	Organization of 4 thematic workshops per year on energy efficiency, use of renewable energy sources, sustainable construction, etc.
Green public procurement	Selection of energy efficient category products and services (e.g. energy saving lighting in buildings owned by the Capital City)	2	Monitoring and comparing the characteristics and quantity of purchased lighting in buildings owned by the Capital City

It is important to emphasize that the above table is not final but, if required, new indicators may be added, which continuous monitoring and control will best demonstrate the effectiveness of implementation of the Action Plan for sustainable use of energy as a resource of the Capital City of Podgorica.

Continuous monitoring, control and reporting on the achieved results are particularly important component of the *Process of elaboration, implementation and monitoring of the Sustainable Energy Action Plan of the Capital City of Podgorica.*

13. Conclusions and recommendations

The Action Plan includes measures and activities to be implemented in order to reduce CO_2 emissions in the territory of the Capital City of Podgorica for 21% by 2020 in relation to the baseline year 2008. Methodology of elaboration of the Action Plan in accordance with the instructions of the European Commission (our regional partner, the Regional Energy Agency of Northwest Croatia actively participated in elaboration of the above instructions which are coordinated at the level of the European Union by the Joint Research Centre of the European Commission). Planned measures and energy consumption are viewed separately for three main sectors - buildings, transport and public lighting, in accordance with recommendations of the European Commission.

Buildings sector is divided into three subsectors:

- Residential buildings and public buildings and enterprises owned by the Capital City of Podgorica;
- Buildings of commercial and service activities that are not owned by the Capital City of Podgorica;
- Residential buildings (excluding residential buildings owned by the Capital City of Podgorica).

Transport sector also includes three sub-sectors:

- Fleet owned by the Capital City of Podgorica;
- Public transport in the territory of the Capital City;
- Private and commercial vehicles.

For the above mentioned sectors and sub-sectors required energy parameters for 2008 were collected, on the basis of which an energy analysis was conducted. Total energy consumption in the Capital City of Podgorica for the three observed sectors is approximately 6,327.64TJ, 4,072.19TJ (64.36%) of which was used in transport sector, followed by the building sector with consumption of 2,214.57 TJ (34.99%) and finally public lighting with 40.87TJ (0.65%). Total CO_2 emission for the Capital City of Podgorica in 2008 was approximately 571.29 kt CO_2. The largest source of emission, as well as consumption of energy-generating products is in transport sector, where emission of 298.67 kt CO_2 (52.28%) was identified, followed by buildings sector with emission of 267.21 kt CO_2 (46.77%) and finally public lighting sector with 5.40 kt CO_2 (0.95%).

In accordance with the results of the conducted energy analysis, the largest share (number) of measures for CO_2 emissions reduction relates to transport (25) and buildings sector (18), while 6 measures were identified for the public lighting sector. Total reduction potential of all identified measures amounts to approximately 201,825.92 tCO_2, or slightly more than 21.49% of CO_2 emissions from 2008, which is more than the planned target of 21%. For this reason, in order to achieve that objective it is not necessary to implement all analyzed and proposed measures, but it is possible to select measure according to abilities for their implementation (temporal, organizational, and financial).

For all measures timeframe of implementation is envisaged, implementers of activities are proposed, costs are estimated (total or per unit measure), savings (in%, kwh, litres of fuel), and potential reduction in CO_2 emissions (tCO_2), as well as associated costs (€/tCO_2). It is significant that for each measure a proposal of fund sources for its implementation is given (budget of the Capital City, loan funds, EU funds, donors).

Main recommendations for successful practical implementation of this Action Plan are as follows:

1. ***Establish an organizational structure as soon as possible (coordination, implementation, monitoring)***

2. ***Introduce a system for monitoring energy consumption and indicators in the territory of the Capital City***

The process of collecting the necessary data on energy consumption for the building and transport sectors for the purpose of this Action Plan proved to be a complex and time-consuming work, and in some cases, especially for the buildings sector, credibility of certain data is questionable. Unlike the above mentioned sectors, data on energy consumption in public lighting sector are monitored systematically and are completely reliable. Taking this into account system for monitoring energy consumption should be based on data from a reliable information system, which, together with the application of modern tools and methods (with remote reading, etc.) would provide reliable, accurate and timely information, but would also warn of possible failures and breakdowns, mismanagement or incorrect calculations.

3. ***Introduce the common classification of energy sectors and sub-sectors in accordance with the Action Plan***

The proposed classification should become part of the mandatory application in municipal institutions, companies and services, but also in all companies that perform energy supply in the territory of the Capital City of Podgorica, regardless of who owns them (e.g. Electricity Distribution Company Podgorica).

4. ***Systematically and responsibly implement proposed measures and activities and manage energy in the territory of the Capital City of Podgorica***

Application of the proposed measures will provide direct energy and financial savings, reduce the adverse impact on the environment, improve the overall quality of life and raise the level of responsibility and awareness of citizens, which is the strategic commitment and policy objective of the Capital City of Podgorica.

5. ***Monitoring and reporting on the achieved results***

By joining the Covenant of Mayors the Capital City of Podgorica committed to development of the Sustainable Energy Action Plan, as well as to continuous reporting to the European Commission on timeframe and effectiveness of its implementation every two years. In addition to formal reporting obligations towards the European Commission, it is proposed to regularly report the public and citizens of the Capital City in order to

ensure their support and active participation in responsible and rational use of energy in the territory of the Capital City of Podgorica.

6. Regular development of CO_2 emissions inventory for the Capital City of Podgorica

In order to successfully monitor savings achieved in different sectors and sub-sectors, as well as achievement of set goals of CO_2 emission reductions, both for the individual measures, and for the implementation of the Action Plan as a whole, it is necessary to develop a new CO_2 emissions inventory for the Capital City of Podgorica. According to the European Commission recommendations, the best results of the entire process of elaboration, implementation and monitoring of the Action Plan would be achieved by developing a new CO_2 emissions inventory every two years, with the methodology identical to the methodology according to which CO_2 baseline emissions inventory for 2008 was developed. Only equal inventory development methodologies enable their comparison and finally answer the question, whether the set objectives of CO_2 emission reductions are met.

7. Review, or, if necessary, elaboration of a new Action Plan

An important part of establishing and implementing systematic energy management in the territory of the Capital City of Podgorica will be review and, if necessary, elaboration of a new action plan. This document would contain analysis of the achieved results (implemented measures, achieved savings, CO_2 emission reductions), and a proposal to a new plan of priority actions and measures based on actual results and data from the new CO_2 emissions inventory. It is necessary to use the same methodology for elaboration of the new Action Plan so that all the results are comparable.