



# PROJECT

# **PRO-ENERGY** - PROMOTING ENERGY EFFICIENCY IN PUBLIC BUILDINGS OF THE BALKAN MEDITERRANEAN TERRITORY

| Work Package:    | 3. Joint Regional Analysis, Strategy and Framework                       |
|------------------|--|
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|                  | analysis-energy efficiency   |
| Activity Leader: | Cyprus Energy Agency- CEA  |
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# **IDENTIFICATION SHEET**

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|--------------------|--|
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# INTRODUCTION

PRO-ENERGY is a transnational cooperation project, co-financed by the Cooperation Programme "Interreg V-B Balkan Mediterranean 2014-2020", under Priority Axis 2, Specific Objective 2.2 Sustainable Territories. The project aims at promoting Energy Efficiency in public buildings in the Balkan Mediterranean territory and to create a practical framework of modelling and implementing energy investments interventions, through specific ICT monitoring and control systems, as well as through energy performance contracting (EPC). The specific objective of PRO-ENERGY is to reduce by more than 20% the energy spending in public buildings of the participating entities in one year after the implementation of pilot actions.

Based on the above, Work Package 3 (WP 3) "Joint Regional Analysis, Strategy and Framework" aims at formulating a Joint Strategy and Action Plan for the whole Balkan Med area regarding energy efficiency through behavioural change based on the analysis of the existing situation regarding energy efficiency in participating territories incorporating mapping of policies, identify good practices and perform benchmarking, define Joint Strategy and Action Plan for the promotion of energy efficiency and prepare for energy interventions in public buildings.

More specifically, Activity 3.1. "Existing situation analysis-energy efficiency" aims to formulating:

- Statistical data about energy efficiency in participating areas
- Identify Stakeholders in each region relevant to energy efficiency
- Analysis of energy efficiency investments in the region/area, mapping of policies, interventions and initiatives
- Policy- Makers and public authorities planning, promoting and implementing initiatives of improving energy efficiency in the areas
- Analysis of the regional and national legal and regulatory framework in each participant region/area and relevant policy-making trends
- Analysis of relevant strategies and their objectives

# Section 1

# 1. Executive Summary

### Status of Energy Efficiency in Public Buildings

 Statistical Data about Energy Efficiency in Public Buildings, Renewable Energy Sources, Energy Performance Certificate

In public buildings in the Region of Epirus for the period 2011-2019, the users consumed more energy for heating and lighting. Public buildings are separated in categories, where the temporary accommodation buildings have the most energy consumption with total primary energy consumption of 953,83 kWh/m2. It is crucial to mention that Education Buildings are the only category that has implemented RES for use. The critical pillar for attaining the core objective is the RES share in electricity consumption.

Therefore, the RES share in electricity consumption is the main policy priority, thus posing the highest demand for the timely and efficient implementation of the measures planned. Attaining this objective requires a sharp increase in RES installed capacity for power generation (approx. 7,000 MW in September 2020), which is expected to more than double for most relevant technologies.

In regard the Energy Performance Certificates, according to the sum of energy performance certificates that have been issued between the years 2011-2019, almost half of the public sector buildings (49.51%) are classified in energy categories C-D, while the largest part of total annual energy consumption is related to heating (131 kWh/m2) and lighting (113 kWh/m2) purposes. The most energy-intensive public service buildings are the penitentiaries (average annual primary energy consumption equal to 652 kWh/m2) and the buildings used for temporary accommodation purposes 781 kWh/m2).

In Cyprus, the average Energy Consumption in non-residential buildings of 130 kWh/m2 per year [2017], where the user has mainly consumed energy for heating, cooling, hot water, and lighting. Cyprus has excellent potential regarding RES, including solar and wind energy, biomass, and geothermal energy use. During the period 2016 - 2018 the increase in the contribution of RES in the country's gross final energy consumption increased from 9,27% to 13,78%, based on the preliminary results obtained from the Ministry of Energy, Commerce, and Industry (MECI).

In general, almost all public buildings in Cyprus are of low energy efficiency and do not meet the national minimum energy performance requirements. Regarding their Energy Performance Certificates (EPC), the energy class of most public buildings ranges from C to E. Therefore, the potential for improving energy efficiency in public buildings is significant. It is essential to mention that according to national legislation (Regulation of Energy Performance of Buildings Laws of 2006 to 2017), all new buildings must be buildings with Nearly Zero Energy consumption by 1 January 2021.

At the Republic of Bulgaria, a certificate's issuance is carried out based on the results that are obtained from an inspection for energy efficiency, which a licensed company must perform under Art. The energy performance certificate contains information on the specific energy consumption of the building, its "energy class", and a feasibility study of appropriate energy-saving measures, including estimated return on investment.

Depending on the examination results, the certificates are issued with category "A", "B", or without category. The category is determined by comparing the building's energy performance with the current energy efficiency standards and the standards in force during the year of commissioning of

the building. Buildings put into operation after 2005 cannot receive an "A" or "B" certificate because they must meet the current standards during construction.

If the issued certificate is of category "A" or "B", the owners will be exempt from building tax for 7 or 3 years, respectively

Policies [ EU directive, Regional and National Regulations]

The EU's energy and climate policy framework, for 2030 set ambitious commitments to reduce carbon dioxide emissions by at least 40%, increase the energy efficiency at least 32.5 % and the renewable energy production at least 32%. For achieving these targets, the European Council adopted a revised legislative framework that includes the Energy Performance of Buildings Directive 2010/31/EU and the Energy Efficiency Directive 2012/27/EU, setting more concrete elements. Specifically, it promotes policies that will send a strong political signal of the EU's commitment to modernize the building sector considering technological improvements and increase building renovations.

Moreover, all new buildings from 31 December 2020 must be nearly zero-energy buildings (NZEB) and since 31 December 2018, all new public buildings already need to be NZEB. Hence, the Commission has introduced a renovation wave for public and private buildings, as part of the European Green Deal, a road map for making the EU's economy sustainable and the EU become climate neutral until 2050. The European Green Deal's main scope is to leverage renovations and reap the significant saving potential of the building sector and ensure buildings to become more efficient.

Furthermore, by March 2020, all EU Member States had to have transposed the revised EPBD into their national legislation and developed long-term renovation strategies to reduce 80 % to 90 % in CO2 emissions by 2050. All EU Member states need to address how they will reduce the skills gaps and how construction companies will tackle this gap. These long-term renovation strategies have a significant public consultation component.

To ensure that the EU targets are met, EU legislation requires that each Member State draft a 10year National Energy and Climate Plan (NECP), setting out how to reach its national targets and reduce greenhouse gas emissions. Cyprus has already prepared a draft of the National Energy and Climate Plan (NECPs) and has set an indicative national energy efficiency target for 2030. The European Commission has recommended that Cyprus clarify how it plans to reach its 2030 greenhouse gas target for sectors outside the EU emissions trading system of -24% compared to 2005 by considering additional policies.

The directives promote policies that will help:

- o achieves a highly energy-efficient and decarbonized building stock by 2050
- o creates a stable environment for investment decisions
- o enables consumers and businesses to make more informed choices to save energy and money

As part of the Clean Energy for all Europeans package, both directives were amended in 2018 and 2019. The Directive amending the Energy Performance of Buildings Directive (2018/844/EU) introduces new elements. It sends a strong political signal on the EU's commitment to modernize the buildings sector considering technological improvements and increase building renovations.

In addition to these requirements, under the Energy Efficiency Directive (2012/27/EU), EU countries must make energy efficient renovations to at least 3% of the total floor area of buildings owned and occupied by central governments. National governments are recommended to only purchase buildings that are highly energy efficient.

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The Commission has also published a series of recommendations on the building renovation (EU)2019/786 and building modernization (EU)2019/1019 aspects of the new rules. The Commissionhas established standards and accompanying technical reports to support the EPBD called the energy performance of buildings standards (EPB standards). The European Committee manages these for Standardization (CEN).

In all countries, the Energy Efficiency framework has set their targets, in need to transpose, the revised EPBD into their national legislation and develop long-term renovation strategies to reduce 80% to 90% in CO2 emissions by 2050. The national targets for the next decade for all partners are being specified in Section 4. Furthermore, legislations set the minimum requirements for public buildings with initiatives to improve the new and existing buildings.

Interventions and Initiatives of improving Energy Efficiency

In all countries, a series of interventions and initiatives have taken place at the national level to implement ambitious plans for both existing and new buildings to enhance the stock of public buildings' energy efficiency. Greece implemented numerous measures following the National Action Plan for Energy Efficiency during 2014-2020 for public buildings and municipalities. The Greek Authorities have adopted additional actions for the renovation of the sum of building stock in Greece. An energy renovation of 600,000 buildings (12% -15% of the total building stock) at an nZEB level to be accomplished by 2030. Adopted by the local council, a signatory's action plan describes the steps towards its 2020 or 2030 targets.

By end-2020, 142 Greek Municipalities that participate in the initiative have conducted and submitted their plans, thus creating the preconditions for taking their energy and climate commitments to the next level. Furthermore, when it comes to the Regional Unit of Thesprotia, Igoumenitsa consists the only Municipality that has successfully developed a Sustainable Energy and Climate Action Plan (SECAP) within the framework of the Covenant of Mayors Initiative.

In Cyprus, in 2016 a committee was set up for upgrading the energy performance of buildings used by central government authorities. Financing of  $\leq 16$  million had already been secured from the European and Structural Funds for 2014-2020 to implement energy upgrading projects in buildings owned and used by the central public administration. In recent years, universities and other research institutions have carried out significant work in the energy upgrading of existing buildings.

Local authorities have endorsed the Covenant of Mayors or the Covenant of Islands or have been accredited by the 'European Energy Prize'. The annual energy saving obligation has been recalculated based on the modifications of the public building stock. The commitment for the period 2021 - 2030 scheduled to be fulfilled mainly with the measures (NECP, 2020) for deep renovations, individual target measures and a behavioural measure in the public sector.

The Republic of Bulgaria's energy policy is in line with the main objectives of the energy policy of the European Union for energy security, competitiveness, and sustainable development. With additional and existing policies and measures, the government will achieve the set national energy efficiency target of 27% by 2030. In compliance with the requirements of the Energy Efficiency Act (EEA) and accordance with the provisions of Directive 2006/32 / EC on energy end-use efficiency and energy services, Bulgaria had adopted an indicative national target for energy savings by 2016 in the amount of less than 9% of the average QES for the period 2001-2005. In this regard, three-year National Action Plans in EE - First (2008-2010) and Second (2011-2013) developed and introduced specific measures to improve energy efficiency in final energy consumption.

# 1.1. Methodology and Structure of the report

Pro Energy partners created this synthesis report base on the response of three national reports developed from Greece, Cyprus, and Bulgaria partners and an EU-wide review regarding Energy Efficiency's policies for the public sector. The following table [Table 1] provides details of the institutions that led to the development of the public sector's current energy efficiency.

TABLE 1: INSTITUTIONS FOR INPUT REPORTS

| Existing Situation Analysis | Institutions   |
|-----------------------------|--|
| of Energy Efficiency in     |  |
| Public Buildings for:       |  |
| Greece                      | Regional Unit of Tesprotia, Development Agency of Evia S.A   |
| Cyprus                      | Cyprus Energy Agency, Electromechanical Services [[Ministry of<br>Transport, Communications and Works] |
| Bulgaria                    | RDA with Business Support Centre for SMEs  |

The deliverable report is structured as follows:

<u>Section 1</u>: Provides general information about the region, constructive building characteristic, electricity consumption and renewable energy sources of the public buildings. [GR, CY, BGR]

Section 2: Stakeholders relevant to EE of public buildings. [GR, CY, BGR]

<u>Section 3:</u> Analysis of EE investments in the area, mapping of policies, interventions, and initiatives. [GR, CY, BGR]

<u>Section 4:</u> Policy - makers and Public Authorities Planning, Promoting and Implementing Initiatives of Improving Energy Efficiency. [GR, CY, BGR]

<u>Section 5:</u> Analysis of Regional and National Legal and Regulatory Framework and Relevant Policy-Making Trends. [GR, CY, BGR]

Section 6: Analysis of Relevant Strategies and their Objectives. [GR, CY, BGR]

# **SECTION 2**

# 2. General Information

### 2.1. Region of Epirus and Regional Unit of Thesprotia

### Information about region

Epirus is one of the thirteen administrative regions of Greece. The region is a traditional geographic and modern administrative region in northwestern Greece. To the south it borders the region of West Greece, to the west the Ionian Islands, to the east the regions of Western Macedonia and Thessaly and to the north, Albania.



FIGURE 1: REGION OF EPIRUS AND REGIONAL UNIT OF THESPROTIA

The Region covers a total area of 9,203.22 km<sup>2</sup> and it is divided into four regional units, namely those of Thesprotia, Ioannina, Arta and Preveza. Its capital and largest city is Ioannina, where nearly one third of the population lives. Additional main urban centers include the cities of Arta, Preveza and Igoumenitsa. According to the census conducted in 2011 by the Hellenic Statistic Authority, the total population amounts to approx. 336,856 people.

The Region's Gross domestic product (GDP) was 4.1 billion  $\notin$  in 2018, accounting for 2.2% of the Greek economic output. GDP per capita adjusted for purchasing power was 14,700  $\notin$  or 49% of the EU27 average in the same year. The GDP per employee was 63% of the EU average. Epirus is the region in Greece with the third lowest GDP per capita and one of the poorest regions in the EU.

The Regional Unit of Thesprotia covers a total area of 1,515 km<sup>2</sup> and its total population equals to 43,587 citizens, according to the census conducted in 2011 by the Hellenic Statistic Authority. It includes three (3) municipalities, namely Igoumenitsa, Filiates and Souli.

### **Climate and Temperature Area**

According to the Energy Efficiency Regulation of Buildings - KENAK, the Greek territory is divided into four climatic zones, based on the degree of heating days, with zone A being the warmest and D the coldest.

As shown in the figure 2, the Region of Epirus belongs to climatic zones B and C. The Regional Units of Thesprotia, Arta and Preveza belong to climatic zone B while the Regional Unit of Ioannina belongs to C.

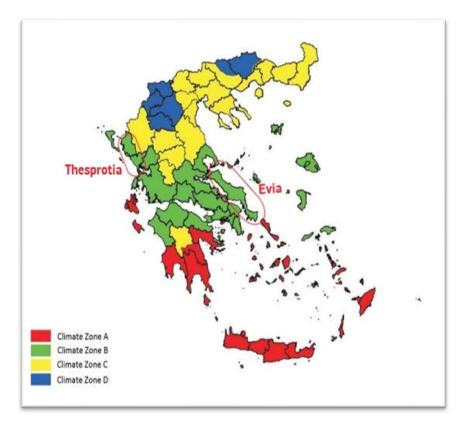


FIGURE 2: CLIMATE ZONES OF GREECE [SOURCE: KENA]

The climate of Epirus Region is mainly alpine. The Region as a whole is rugged and mountainous. However, there is a differentiation of climate conditions among regional units. Cold winters of a semi-alpine climate dominate the eastern part and higher elevations, while the Region's capital city (loannina) suffers from heavy rainfall during the whole year.

On the other hand, the coastal areas have a mild Mediterranean climate and milder winters and temperatures that rarely drop below zero, while in the summer they reach quite high temperatures with rare rainfall.

As long as the Regional Unit of Thesprotia is concerned, on the coast and in the lowland zone the climate is Mediterranean, with mild winters and warm summers, while in the semi-mountainous and mountainous hinterland the climate renders to continental.

# Statistical Data about Energy Efficiency in Public Buildings

The following figure 3, presents the average primary energy consumption (kWh/m2) in public buildings in the Region of Epirus for the period 2011-2019.

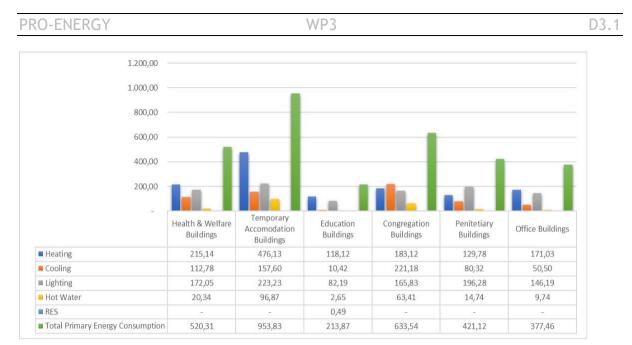


FIGURE 3: AVERAGE PRIMARY ENERGY CONSUMPTION PER PURPOSE - PUBLIC BUILDINGS/REGION OF EPIRUS (KWH/M<sup>2</sup>) [Source:Ministry of Environment & Energy]

When it comes to public buildings' classification according to their energy efficiency score (as per the energy performance certificate's scale) the current state of play regarding the Region of Epirus is presented to Figure 4.

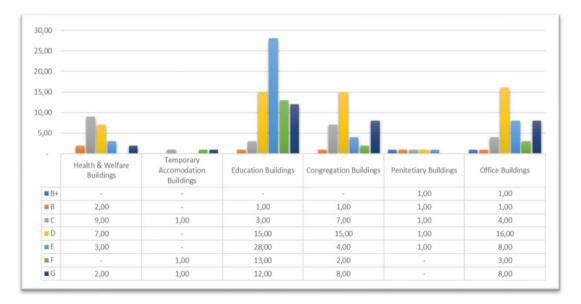


FIGURE 4: ENERGY PERFORMANCE CERTIFICATES PER USE AND CLASS - PUBLIC BUILDINGS/REGION OF EPIRUS (KWH/m<sup>2</sup>) [SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

The data are referring to the Energy Performance Certificates that have been issued for Public Sector Buildings. It is more than obvious that the Region's performance concerning public buildings' energy efficiency is rather poor, as more than half of them belongs to Categories D and E, while none has achieved an A/A+ Grade.

As long as the Regional Unit of Thesprotia is concerned, primary energy consumption (kWh/m2) in public buildings is presented to Figure 5.

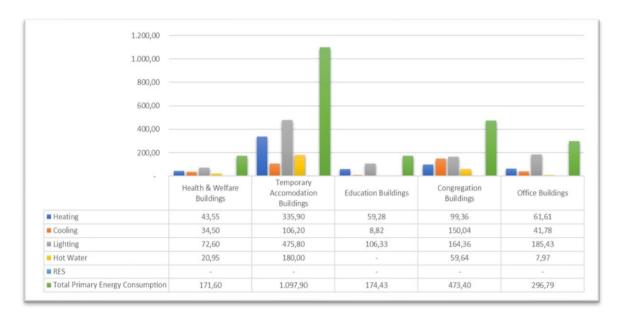


FIGURE 5: AVERAGE PRIMARY ENERGY CONSUMPTION PER PURPOSE - PUBLIC BUILDINGS/REGIONAL UNIT OF THESPROTIA (KWH/M2) [SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

When it comes to public buildings classification according to their energy efficiency score (as per the energy performance certificate scale) the current state of play regarding the Regional Unit of Thesprotia is presented to Figure 6.

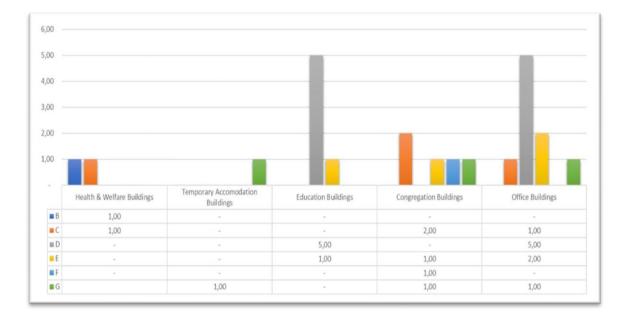


FIGURE 6: ENERGY PERFORMANCE CERTIFICATES PER USE AND CLASS - PUBLIC BUILDINGS/REGIONAL UNIT OF THESPROTIA (KWH/M2) [SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

The data are referring to the Energy Performance Certificates that have been issued for Public Sector Buildings. The Regional Unit's performance concerning buildings' energy efficiency is poor, as the majority (14 buildings) belongs to Class D and E, while no public buildings have achieved an A/A+Grade.

# Renewable Energy Sources

According to National Energy and Climate Plan (NECP), published in December 2019, Greece has set a core objective for achieving a RES share of at least 35% in in gross final energy consumption by 2030.Moreover, there are additional targets for the RES share in gross final electricity consumption

Cyprus Energy Agency

to reach at least 60%, the RES share in covering heating and cooling needs to exceed 40% and the RES share in the transport sector to exceed 14% in line with the relevant EU calculation methodology.

Apparently, the key pillar for attaining the core objective is the RES share in electricity consumption, and therefore this sub-sector is the main policy priority, thus posing the highest demand for the timely and efficient implementation of the measures planned. Attaining this objective requires a sharp increase in RES installed capacity for power generation (approx. 7,000 MW in September 2020), which is expected to more than double for most of the relevant technologies.

Furthermore, a specific objective has been set for promoting RES systems in buildings and dispersed generation systems, through auto production and net metering schemes. More specifically, a forecast has been made for having such RES power generation systems in operation with an installed capacity of 1 GW, capable of covering the average electricity consumption of at least 330,000 Greek households, by 2030. NECP acknowledges as a challenge the gradual expansion of net-metering schemes in Greece and the attainment of higher-than-today growth rates.

Regarding the penetration and the share of RES to meet thermal needs in final consumption, it is expected that there will be a significant increase in the role of heat pumps, especially in the tertiary sector, an increased share of thermal solar systems and geothermal energy, as well as a steady contribution of biomass (NCEP sets a target for approx. 2.5 GW of installed capacity for all the three aforementioned types' contribution to meet thermal needs in final consumption by 2030). As long as the Region of Epirus is concerned, the total installed RES capacity, as per September 2020, is presented to the following table.

| RES Type                    | Installed Capacity<br>(MW) |
|-----------------------------|----------------------------|
| Wind Farms                  | 619                        |
| Small Hydro Power<br>Plants | 47                         |
| Biomass/Biogas              | 4                          |
| PVs                         | 180                        |
| Total                       | 849                        |

TABLE 2: RES INSTALLED CAPACITY - REGION OF EPIRUS - [SOURCE: DAPEEP/RES INFO NOTE SEP-20]

### **Energy Performance Certificate**

According to the Buildings' Energy Efficiency Regulation (KENAK - Government Gazette B'/2367/12.07.2017) and Law 4122/2013 (as in place), Energy Performance Certificate includes:

- Energy efficiency data for the building or the building unit, as well as a series of benchmarks concerning minimum energy efficiency requirements, in order to allow the owners or the tenants of the building to compare and evaluate its energy efficiency score. The energy efficiency categories' breakdown is A +, A, B +, B, C, D, E, F and G.
- Additional information, such as general building details, estimated annual total primary energy consumption of the very building vs a benchmark building of reference, the actual annual energy consumption of the building or building unit, the percentage of participation of RES produced in the total energy consumption, estimated and actual annual carbon dioxide emissions (kg/m<sup>2</sup>) and the results of the assessment conducted by the energy inspector regarding the quality of the building's internal environment.
- Financially affordable recommendations for improving the energy efficiency of the building or the building unit, unless there is not a reasonable possibility of upgrading its characteristics compared to the applicable requirements for energy efficiency. When it comes to public sector, energy performance certificate is mandatory for all public sector buildings of more than 250 m<sup>2</sup> total floor surface, in which regular interaction with the general public takes place. It is mandatory for the Energy Performance Certificates of public buildings to be posted in public view.

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For the year 2019, 780 energy performance certificates were issued for public sector buildings in Greece (0.25% of the total amount of certificates issued), that cover a total surface of 665,988 m<sup>2</sup>. Most of them (47.82%) are classified in energy category C-D, 43.21% in energy category E-G and only a 8.97% in A-B.

It has been recorded that for the year 2019, indoor swimming pools (average annual primary energy consumption of 3,598 kWh/m<sup>2</sup>), indoor gyms (1,107 kWh/m<sup>2</sup>) and institutions (1,002 kWh/m<sup>2</sup>) constitute the most energy consuming public sector buildings. In public sector buildings, the largest amount of energy consumed refers to covering need related to heating purposes (average annual consumption of primary energy in heating equal to 159 kWh/m2) and to lighting (118 kWh/m2).

According to the sum of energy performance certificates that have been issued between the years 2011-2019, almost half of the public sector buildings (49.51%) are classified in energy categories C-D, while the largest part of total annual energy consumption is related to heating (131 kWh/m<sup>2</sup>) and lighting (113 kWh/m<sup>2</sup>) purposes. In addition, the most energy-intensive public service buildings are the penitentiaries (average annual primary energy consumption equal to 652 kWh/m<sup>2</sup>) and the buildings used for temporary accomodation purposes 781 kWh/m<sup>2</sup>).

### 2.2. Region of Sterea Ellada and Regional Unit of Evia

### Information about region

Sterea Ellada is one of the thirteen administrative regions of Greece. The Region occupies the eastern half of the geographical prefecture of Continental Greece, including the island of Evia. To the south, it borders the regions of Attica and Peloponnese, to the west the region of West Greece and to the north the regions of Thessaly and Epirus.



FIGURE 7: REGION OF STEREA ELLADA

The Region covers a total area of 15,549 km2 and it is divided into five regional units, namely those of Boeotia, Evia, Evrytania, Phocis and Pthiotis. Its capital city is Lamia, while Chalkida (which is the capital city of the Regional Unit of Evia) is the Region's most populated city (102,000 citizens). Additional main urban centers include the cities of Livadia, Thebes, Amfissa and Karpenisi.

According to the census conducted in 2011 by the Hellenic Statistic Authority, the total population amounts to approx. 547,000 people. The Region's Gross Domestic Product (GDP) was 8.8 billion  $\in$  in 2018, accounting for 4.7% of the Greek economic output. GDP per capita adjusted for purchasing power was 18,900  $\in$  or 63% of the EU27 average in the same year. The GDP per employee was 81% of the EU average. Sterea Ellada is the region of Greece with the fourth highest GDP per capita.

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The Regional Unit of Evia includes the islands of Evia and Skyros, as well as a small part of Sterea Ellada. Evia is the second largest island of the Greek archipelago after Crete. It is separated from the main country by the Evian Sea which consists of two large bays. The Regional Unit covers a total area of

4,164 km2 and its total population equals to approx. 211,000 citizens. It includes eight (8) municipalities, namely Chalcis, Dirfys-Messapia, Eretria, Istiaia-Aidipsos, Karystos, Kymi-Aliveri, Mantoudi-Limni-Agia Anna and Skyros.

### Climate and Temperature Area

According to the Energy Efficiency Regulation of Buildings - KENAK, the Greek territory is divided into four climatic zones, based on the degree of heating days, with zone A being the warmest and D the coldest. As shown in the next picture, the Region of Sterea Ellada belongs to zone B. There is a differentiation of climate conditions within the Region, as in the mainland - mainly characterized by mountainous areas - climate is cold with heavy rainfalls and snowfalls to take place, especially during winter, while low temperatures are recorded.

On the other hand, and as long as the coastal areas are concerned, the climate is characterized as Mediterranean, with an average annual temperature of 18 oC. In the west, the coasts and plains are affected by westerly winds, resulting in increased rainfall during the winter months, that often reach 700 mm. In contrast, in the eastern lowland and coastal areas, rainfall does not exceed 500 mm per year.

# Statistical Data about Energy Efficiency in Public Buildings

The following figure presents the average primary energy consumption (kWh/m2) in public buildings in the Region of Sterea Ellada for the period 2011-2019.

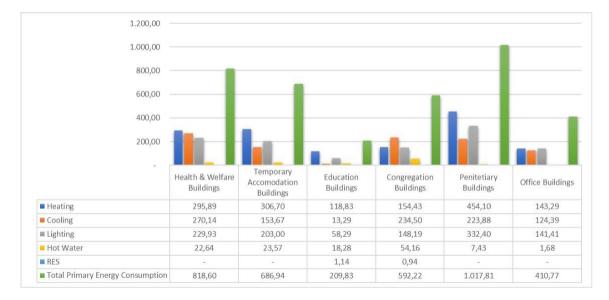


FIGURE 8: AVERAGE PRIMARY ENERGY CONSUMPTION PER PURPOSE - PUBLIC BUILDINGS/REGION OF STEREA ELLADA (KWH/M2)-[SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

When it comes to public buildings' classification according to their energy efficiency score (as per the energy performance certificate's scale) the current state of play regarding the Region of Sterea Ellada is presented to Figure 9.

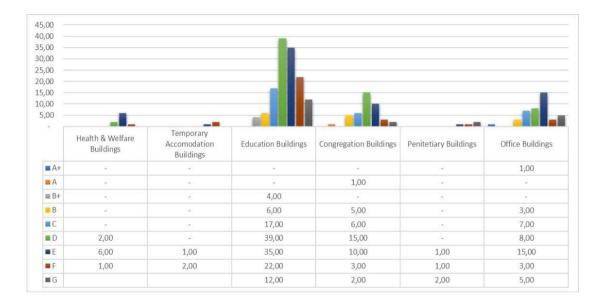
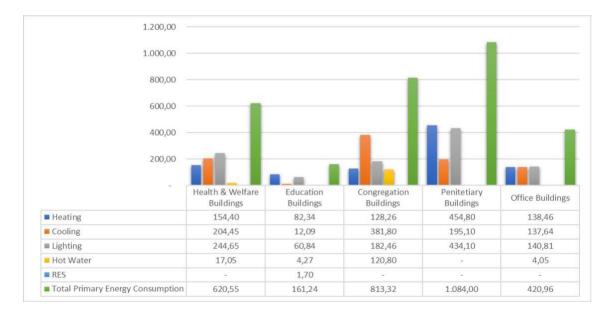


FIGURE 9: ENERGY PERFORMANCE CERTIFICATES PER USE AND CLASS - PUBLIC BUILDINGS/REGION OF STEREA ELLADA (KWH/M2) - [SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

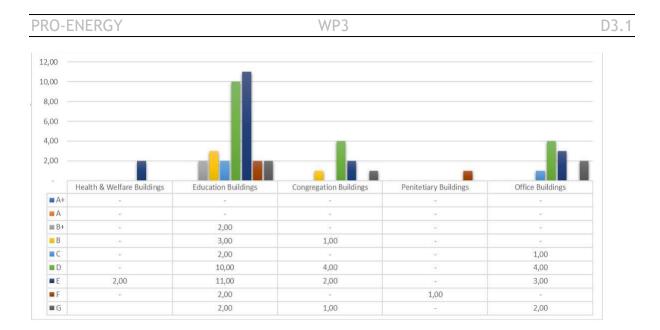
The data are referring to the Energy Performance Certificates that have been issued for Public Sector Buildings. It is more than obvious that the Region's performance concerning buildings' energy efficiency is rather poor, as almost half of them belongs to Categories D and E, while only two buildings have achieved an A/A+ Grade.



As long as the Regional Unit of Evia is concerned, primary energy consumption  $(kWh/m^2)$  in public buildings is presented to Figure 5.

FIGURE 10: AVERAGE PRIMARY ENERGY CONSUMPTION PER PURPOSE - PUBLIC BUILDINGS/REGIONAL UNIT OF EVIA (KWH/M2) -[SOURCE: MINISTRY OF ENVIRONMENT & ENERGY]

When it comes to public buildings classification according to their energy efficiency score (as per the energy performance certificate scale) the current state of play regarding the Regional Unit of Evia is presented to Figure 11.



The data are referring to the Energy Performance Certificates that have been issued for Public Sector Buildings. The Regional Unit's performance concerning buildings' energy efficiency is poor, as the majority (36 buildings) belongs to Class D and E, while no buildings have achieved an A/A+ Grade.

### **Renewable Energy Sources**

According to the National Energy and Climate Plan (NECP), published in December 2019, Greece has set a core objective for achieving a RES share of at least 35% in in gross final energy consumption by 2030.

Moreover, there are additional targets for the RES share in gross final electricity consumption to reach at least 60%, the RES share in covering heating and cooling needs to exceed 40% and the RES share in the transport sector to exceed 14% in line with the relevant EU calculation methodology.

Apparently, the key pillar for attaining the core objective is the RES share in electricity consumption, and therefore this sub-sector is the main policy priority, thus posing the highest demand for the timely and efficient implementation of the measures planned. Attaining this objective requires a sharp increase in RES installed capacity for power generation (approx. 7,000 MW in September 2020), which is expected to more than double for most of the relevant technologies.

Furthermore, a specific objective has been set for promoting RES systems in buildings and dispersed generation systems, through auto production and net metering schemes. More specifically, a forecast has been made for having such RES power generation systems in operation with an installed capacity of 1 GW, capable of covering the average electricity consumption of at least 330,000 Greek households, by 2030. NECP acknowledges as a challenge the gradual expansion of net-metering schemes in Greece and the attainment of higher-than-today growth rates.

Regarding the penetration and the share of RES to meet thermal needs in final consumption, it is expected that there will be a significant increase in the role of heat pumps, especially in the tertiary sector, an increased share of thermal solar systems and geothermal energy, as well as a steady contribution of biomass (NECP sets a target for approx. 2.5 GW of installed capacity for all the three aforementioned types' contribution to meet thermal needs in final consumption by 2030).

As long as the Region of Sterea Ellada is concerned, the total installed RES capacity, as per September 2020, is presented to the following table.

TABLE 3: RES INSTALLED CAPACITY - REGION OF STEREA ELLADA -[SOURCE: DAPEEP/RES INFO NOTE SEP-20]

| RES Type                 | Installed Capacity (MW) |
|--------------------------|-------------------------|
| Wind Farms               | 1.125                   |
| Small Hydro Power Plants | 33                      |
| Biomass/Biogas           | 1                       |
| PVs                      | 361                     |
| Total                    | 1.520                   |

### **Energy Performance Certificate**

According to the Buildings' Energy Efficiency Regulation (KENAK - Government Gazette B'/2367/12.07.2017) and Law 4122/2013 (as in place), Energy Performance Certificate includes:

- Energy efficiency data for the building or the building unit, as well as a series of benchmarks concerning minimum energy efficiency requirements, in order to allow the owners or the tenants of the building to compare and evaluate its energy efficiency score. The energy efficiency categories' breakdown is A +, A, B +, B, C, D, E, F and G.
- Additional information, such as general building details, estimated annual total primary energy consumption of the very building vs a benchmark building of reference, the actual annual energy consumption of the building or building unit, the percentage of participation of RES produced in the total energy consumption, estimated and actual annual carbon dioxide emissions (kg/m<sup>2</sup>) and the results of the assessment conducted by the energy inspector regarding the quality of the building's internal environment.
- Financially affordable recommendations for improving the energy efficiency of the building or the building unit, unless there is not a reasonable possibility of upgrading its characteristics compared to the applicable requirements for energy efficiency.

When it comes to public sector, energy performance certificate is mandatory for all public sector buildings of more than  $250 \text{ m}^2$  total floor surface, in which regular interaction with the general public takes place. It is mandatory for the Energy Performance Certificates of public buildings to be posted in public view.

For the year 2019, 780 energy performance certificates were issued for public sector buildings in Greece (0.25% of the total amount of certificates issued), that cover a total surface of 665,988 m<sup>2</sup>. Most of them (47.82%) are classified in energy category C-D, 43.21% in energy category E-G and only a 8.97% in A-B.

It has been recorded that for the year 2019, indoor swimming pools (average annual primary energy consumption of  $3,598 \text{ kWh/m}^2$ ), indoor gyms ( $1,107 \text{ kWh/m}^2$ ) and institutions ( $1,002 \text{ kWh/m}^2$ ) constitute the most energy consuming public sector buildings. In public sector buildings, the largest amount of energy consumed refers to covering need related to heating purposes (average annual consumption of primary energy in heating equal to 159 kWh/m2) and to lighting (118 kWh/m2).

According to the sum of energy performance certificates that have been issued between the years 2011-2019, almost half of the public sector buildings (49.51%) are classified in energy categories C-D, while the largest part of total annual energy consumption is related to heating (131 kWh/m<sup>2</sup>) and lighting (113 kWh/m<sup>2</sup>) purposes. In addition, the most energy-intensive public service buildings are the penitentiaries (average annual primary energy consumption equal to 652 kWh/m<sup>2</sup>) and the buildings used for temporary accommodation purposes 781 kWh/m<sup>2</sup>).

# 2.3. Cyprus

# Information about Cyprus



| Capital           | Nicosia   |
|-------------------|---|
| Official language | Two official languages: Greek and Turkish;<br>Only Greek is an official EU language |
| Government        | Presidential system   |
| President         | Nicos Anastasiades  |
| Area              | 9.251 sq km (3.355 sq km area in the occupied by Turkey <i>area</i> )               |
| Population        | 840.407 Under the Government Controlled area Total population 1.205.933             |

# **Climate and Temperature Area**

According to the official classification, Cyprus is split into 4 climatic zones: coastal, low-land, semimountainous, and mountainous area. Although, most buildings are located in the three first zones, their energy demand does not differ substantially, while only the buildings located at the mountainous area is characterized by significant differences. [figure 12].

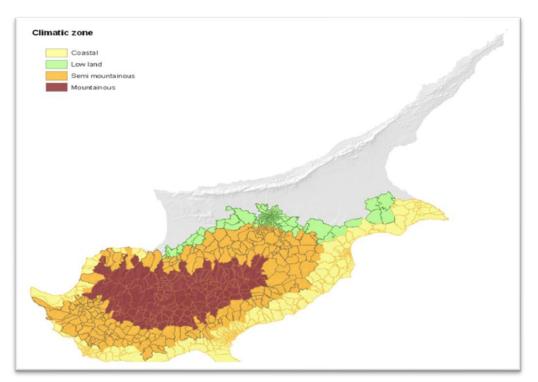


FIGURE 12: CLIMATIC CLASSIFICATION OF THE CYPRUS TERRITORY [SOURCE: M. ECONOMIDOU ET AL., 2017]

Moreover, Table 2 presents the distribution of the buildings per sector in each climatic zone in Cyprus. The 54% (221.981) of the buildings are located at the coastal area, the 33% (133.872) of the buildings are located at the low land area, whereas only the 10% (40.588) of the buildings are located at the semi-mountainous area, and 3% (11.927) at the mountainous area.

|                                     | Coastal<br>Area | Low Land<br>Area | Semi<br>Mountainous<br>Area | Mountainous<br>Area |
|-------------------------------------|-----------------|------------------|-----------------------------|---------------------|
| Residential<br>Sector*              | 163.005         | 98.977           | 32.110                      | 9.150               |
| Primary<br>Sector                   | 2.148           | 311              | 853                         | 371                 |
| Tertiary<br>Sector                  | 48.737          | 30.958           | 5.901                       | 1.957               |
| Secondary<br>(Industrial)<br>Sector | 8.091           | 3.626            | 1.724                       | 449                 |
| Total                               | 221.981         | 133.872          | 40.588                      | 11.927              |

 TABLE 4: DISTRIBUTION OF BUILDINGS PER SECTOR IN EACH CLIMATIC ZONE (CYPRUS STATISTICAL SERVICE, 2017)

The number of public buildings, which fall under the public administration and defence economic activity, are presented in Figure 13.

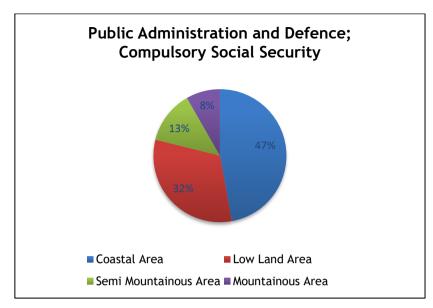


FIGURE 13: DISTRIBUTION OF PUBLIC BUILDINGS PER EACH CLIMATIC ZONE (CYPRUS STATISTICAL SERVICE, 2017)

# Statistical Data about Energy Efficiency in Public Buildings

### • Constructive building characteristic

In general, the building stock in Cyprus can be divided into 5 chronological periods: before 1959, from 1960 to 1974, from 1975 to 1990, from 1991 to 2006 and from 2007 until today. Regarding the constructive materials, buildings with reinforced concrete frame and bricks are among the most common types of buildings that are manufactured in Cyprus, mainly for use as residences (apartments). In Cyprus, the construction materials that have experienced the most significant increase in costs are cement and iron, while bricks follow. Concerning the most prevalent building materials used, most buildings have been constructed of concrete, followed by bricks and cement blocks. The third most important construction material appears to be stone. Most buildings in Cyprus were built before 2000 (80%) and have no thermal insulation (generally they have not taken energy efficiency measures) (Charalambous et al., 2019).

A categorization of tertiary buildings according to construction period and construction materials is unfortunately not possible, due to the absence of detailed data from the Cyprus Statistical Service. What can be observed nonetheless, is that (like residential dwellings) most buildings in the tertiary sector and, therefore the public buildings, have been constructed without requirements for thermal insulation or any other energy efficiency measures. The majority (approximately 85%) of the building stock of the tertiary sector was built before the first legislation regarding energy performance requirements.

|   | Total Area (m²) | Number | Mean Area (m²) |
|---|-----------------|--------|----------------|
| Public Buildings                              | 1.886.370       | 1.087  | 1.735          |
| Public primary schools,<br>and nursery        | 453.755         | 325    | 1.396          |
| Gymnasiums, Lyceums,<br>and Technical Schools | 613.546         | 144    | 4.261          |

TABLE 5: TOTAL AREA AND NUMBER OF PUBLIC BUILDINGS (M. ECONOMIDOU ET AL., 2017)

**PRO-ENERGY** 

WP3

| Higher education                    | 222.404 | NA | NA |
|-------------------------------------|---------|----|----|
| (public unis, colleges,             |         |    |    |
| etc.)                               |         |    |    |
| <br>E 6: OVERALL STRUCTURAL RATA OF |         |    |    |

TABLE 6: OVERALL STRUCTURAL DATA OF A TYPICAL PUBLIC BUILDING

| The structural<br>elements of a typical<br>public building | Construction<br>materials | Insulation<br>[Yes/No] | U-Value<br>[W/m2k] | Minimum U-Value<br>requirements<br>according to<br>current regulation<br>for new non-<br>residential<br>buildings<br>[W/m2k] |
|--|---------------------------|------------------------|--------------------|--|
| External Walls   | bricks                    | No                     | 1,4                | 0,4  |
| Floor  | cement and<br>iron        | No                     | 0,7                | -  |
| Exposed Roof   | cement and<br>iron        | No                     | 3,6                | 0,4  |
| Windows  | Single glazed             | No                     | 6,0                | 2,25   |

In general, it can be assumed that the tertiary sector follows the description of the structure and construction materials of the residential sector, as well as the same period of development. Consequently, the energy situation of the vast majority of public buildings can be characterized as very poor to moderate, since the buildings are rented by the government and generally the owners did not take any energy efficiency measures in the construction of the building. Table 5 provides an overview of the public buildings with information on their total floor area, number of establishments, and average floor area. Table 6 gives an overview of the structural characteristics of public buildings.

### • Electricity Consumption

In Cyprus, public buildings are used by central government authorities (Ministries, police, the Attorney General's Office); local authorities; public schools, public universities, and other public educational institutions; and the army. In most public buildings, electricity is used to meet all energy needs, hence implying an average consumption of 130 kWh/m2 per year. Error! Reference source n ot found. presents the energy demand of a typical public building and school, while Error! Reference source not found. gives an overview of the main systems used for heating, cooling, hot water, and lighting.

|                     | Year of construction                | Heating<br>(kWh/m²/year) | Cooling<br>(kWh/m²/year) | Hot Water<br>(kWh/m²/year) | Lighting<br>(kWh/m²/year) |
|---------------------|-------------------------------------|--------------------------|--------------------------|----------------------------|---------------------------|
| Public<br>Buildings | Before<br>insulation<br>regulations | 49                       | 44                       | 5                          | 42                        |
|                     | After<br>insulation<br>regulations  | 34                       | 30                       | 4                          | 37                        |

TABLE 7: ENERGY DEMAND OF PUBLIC BUILDINGS AND SCHOOLS (M. ECONOMIDOU ET AL., 2017)

D3.1

| PRO-ENERGY |                                     |    | WP3 |   | D3.1 |
|------------|-------------------------------------|----|-----|---|------|
| Schools    | Before<br>insulation<br>regulations | 35 | 55  | 7 | 35   |
|            | After<br>insulation<br>regulations  | 24 | 37  | 5 | 30   |

|                  | Heating                        | Cooling   | Hot water  | Lighting         |
|------------------|--------------------------------|---|--|------------------|
| Public Buildings | Central heating-<br>oil boiler | Central cooling<br>systems and Split<br>units       | Solar thermal<br>collectors or<br>through central<br>heating | Fluorescent tube |
| Schools          | Central heating-<br>oil boiler | Fans in classrooms<br>and Split units in<br>offices | Solar thermal<br>collectors or<br>through central<br>heating | Fluorescent tube |

# Renewable Energy Sources

Cyprus has great potential regarding Renewable Energy Sources (RES), which include solar and wind energy, biomass, and the use of geothermal energy of low enthalpy.

All RES plants/systems in Cyprus are either:

- autonomous systems (not connected to the electricity grid), or
- producers of electricity from RES that are connected to the grid and feed their electricity into it, or
- producers of electricity from RES that are connected to the grid and use the electricity produced for their own use and feed the excess electricity into the grid (PV systems under net-metering scheme & PV or biomass systems under the netbilling scheme), or
- solar thermal systems for domestic hot water use.

Despite the increasing contribution of RES in the gross final energy during the last years, there is still plenty of room for further exploitation considering the country's real potential. During the period 2016 - 2018 the increase in the contribution of RES in the gross final energy consumption of the country increased from 9,27% to 13,78%, based on the preliminary results obtained from the Ministry of Energy, Commerce, and Industry (MECI). As an EU Member State, Cyprus must comply with a national renewable energy target currently set at 13% of gross final energy consumption from renewable energy by the end of 2020 and 26% by 2030.

Cyprus citizens are familiarized with the use and exploitation of solar thermal technology for the production of hot water. 92% of the households and over 50% of the hotels in Cyprus, have solar water heating systems installed on-site. Despite the extremely widespread proliferation of solar thermal

systems for domestic hot water uses, the solar heat applications for industrial processes in Cyprus are still limited. The Government of Cyprus has developed various support schemes and incentives (grant schemes) for RES projects. Most of these instruments are intended to be financed by the national budget (funds from the Special Fund for RES & EE,) some with assistance from EU funds.

Most of the Support Schemes for RES are related to net-metering and net-billing and target residential, tertiary & industrial sectors. The net-metering and net-billing support schemes are open to household owners and SMEs from all sectors of economic activity, including the public sector. The size of the PV system under the net-metering and net-billing scheme should not exceed 10 kW and 10 MW, respectively.

According to the Energy Authority of Cyprus, until the end of 2019 and since 2013 when the netmetering scheme was initiated, 14.779 systems of around 54MW total capacity were implemented. Regarding the net-billing scheme, until the end of 2019 and since March of 2019 when the scheme was initiated, 72 PV systems of 4,3MW total capacity and 1 Biomass system of 2,4MW capacity were installed. Regarding the PV systems installed in public buildings, until December 2017, approximately 20 PV systems were installed under the net-metering scheme.

# Energy Performance Certificate

Buildings that belong to the central government have to be upgraded by the competent authority, which is the Department of Public Works of the Ministry of Transport, Communication, and Works while the energy performance of local authorities' buildings is the responsibility of the local authorities. For public schools, energy performance is the responsibility of the technical services of the Ministry of Education. Public universities have their own budget through the state budget, and they are responsible for upgrading the respective buildings.

In general, almost all public buildings in Cyprus are of low energy efficiency and do not meet the national minimum energy performance requirements. As regards their Energy Performance Certificates (EPC), the energy class of the majority of public buildings ranges from C to E. Therefore, the potential for improving energy efficiency in public buildings is significant.

It should be noted that according to the national legislation all public buildings with a total useful floor area over 250 m<sup>2</sup> must have an EPC issued. Based on the data obtained from the Energy Service of the MECI, only 84 out of 1.087 public buildings issued an EPC, where their energy class is shown in the figure below.

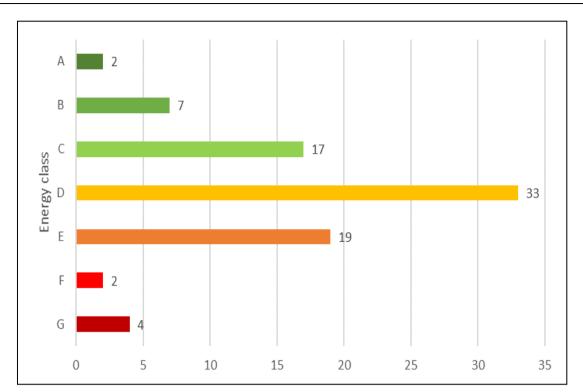


FIGURE 14: ENERGY CLASS OF PUBLIC BUILDINGS

It is important to mention that according to national legislation (Regulation of Energy Performance of Buildings Laws of 2006 to 2017), all new buildings must be buildings with Nearly Zero Energy consumption by 1 January 2021, whereas all new public buildings must be buildings with Nearly Zero Energy consumption by 1 January 2019. In addition, there is an obligation that every public building should appoint at least one officer who will be the Energy Saving Officer of the building. These officers ensure that energy-saving measures, especially zero-cost measures, are implemented as much as possible.

Also, they draw up and send to the Energy Service of the MECI an annual report on energy consumption and actions about the energy consumption and energy measures taken the previous year at the building under their responsibility. Training and meetings with these officers are organized on an annual basis by the Energy Service, aiming to train and inform them about energy efficiency issues.

# 2.4. Bulgaria

### Information about region

Plovdiv Region/District is located in the central part of Southern Bulgaria on an area of 5972.9 km2 and has a population of 675,586 people (according to NSI data for 2014). There are 18 municipalities on the territory of Plovdiv district - Asenovgrad municipality, Brezovo municipality, Kaloyanovo municipality, Karlovo municipality, Krichim municipality, Kuklen municipality, Lucky municipality, Perushtitsa municipality, Parvomay municipality, Rakovski municipality, Sadovo municipality, Sopot municipality, Stamboliyski municipality, Saedinenie, Hissarya municipality, Maritsa municipality, Rodopi municipality and Plovdiv municipality.

Priority industries in Plovdiv district are agriculture, food industry, tourism, clothing and textile industry, wood processing and furniture industry. The growth of the IT sector, outsourcing, the processing industry, business services and communication services is also great. These are the sectors with the most significant contribution to the employment of graduates and qualified staff.

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Plovdiv and the region are among the most important tourist destinations that glorify Bulgaria in the world with its huge cultural and historical heritage and rich archeology. Plovdiv is the oldest living city in Europe and the sixth oldest city in the world. Plovdiv has been chosen to be the European Capital of Culture in 2019. Plovdiv is a geographical and logistical center of the Thracian tourist region, which is endowed with abundant nature with resources - mountains, valleys, valleys, rock formations, caves, lakes, dams, rivers, mineral and karst waters, diverse flora and fauna, and with a unique anthropogenic resource - Thracian and medieval fortresses, Revival settlements, religious temples, fairs, architectural and ethnographic and folklore reserves. The possibilities for combining cultural with health, rural, spa and sports tourism in the region are very diverse.

### **Climate and Temperature Area**

The climate in Plovdiv is transitional-continental, typical for quite central southern parts of Europe. The average annual temperature is 12.3 °C. The average maximum temperature in July was 30.3 °C, and the absolute maximum was measured on July 5, 2000: 45 °C. The average annual minimum temperature is 6.5 °C, and the absolute minimum is minus 31.5 °C, measured in the morning of January 24, 1942 in a state of temperature inversion. The average annual relative humidity is 73%, with the highest in December (86%) and the lowest in August (62%).

# Statistical Data about Energy Efficiency in Public Buildings

### • Constructive building characteristic

TABLE 9: TOTAL AREA AND NUMBER OF PUBLIC BUILDINGS

|  | Total Area (m2) | Number | Mean Area (m2) |
|--|-----------------|--------|----------------|
| Public Buildings                                     | 1,068,309.6     | 925    | 1,154          |
| Public primary schools, and nursery                  | -               | 99     | -              |
| Gymnasiums,<br>Lyceums, and<br>Technical Schools     | -               | 49     | -              |
| Higher education<br>(public unis, colleges,<br>etc.) | -               | 13     | -              |

TABLE 10: OVERALL STRUCTURAL DATA OF A TYPICAL PUBLIC BUILDING

| The structural<br>elements of a<br>typical public<br>building | Construction<br>materials | Insulation<br>[Yes/No] | U-Value<br>[W/m2k] | Minimum U-Value<br>requirements<br>according to<br>current regulation<br>for new non-<br>residential<br>buildings<br>[W/m2k] |
|---|---------------------------|------------------------|--------------------|--|
| External Walls  | Bricks                    | No                     | U <0.50            | U <0.15  |
| Floor   | Concrete                  | No                     | U <0.50            | U <0.15  |
| Exposed Roof  | Wooden                    | No                     | U <0.30            | U <0.15  |
| Windows   | Wooden                    | No                     | U <2.60            | U <0.70  |

# • Electricity consumption

TABLE 11: ENERGY DEMAND OF PUBLIC BUILDINGS AND SCHOOLS

|                     | Year of construction          | Heating<br>(kWh/m²/y<br>ear) | Cooling<br>(kWh/m²/year) | Hot Water<br>(kWh/m²/year) | Lighting<br>(kWh/m²/year) |  |  |
|---------------------|-------------------------------|------------------------------|--------------------------|----------------------------|---------------------------|--|--|
| Public<br>Buildings | Before insulation regulations | 155MWh/y                     |                          |                            |                           |  |  |
|                     | After insulation regulations  | 120MWh/y                     |                          |                            |                           |  |  |
| Schools             | Before insulation regulations |                              | 349                      | 9MWh/y                     |                           |  |  |
|                     | After insulation regulations  | 175MWh/y                     |                          |                            |                           |  |  |

TABLE 12: OVERALL SYSTEM DATA OF A TYPICAL PUBLIC BUILDING AND SCHOOL

|                     | Heating   | Cooling                       | Hot water          | Lighting  |
|---------------------|---|-------------------------------|--------------------|-----------|
| Public<br>Buildings | Central<br>heating  | Individual Air<br>Conditioner | Central<br>heating | Fluorence |
| Schools             | Central<br>heating or<br>local heating<br>diesel or<br>pellets boiler | -                             | -                  | Fluorence |

# **Renewable Energy Sources**

Municipal programs and submitted reports on their implementation in ASED South Central Planning Region 5 districts - Plovdiv, Pazardzhik, Haskovo, Kardzhali and Smolyan with a total of 58 municipalities. Reports on the implementation of MPPUERSBF for 2018 were submitted by 55 municipalities and 5 district administrations. No reports were submitted by 3 municipalities - Parvomay, Haskovo and Strelcha.

| Region    | Number of<br>municipalities | Municipalities<br>with<br>operating<br>MPPUERSBF<br>until 2018. | Municipalitie<br>s with<br>operating<br>MPPUERSBF<br>after 2018. | Number of<br>municipaliti<br>es without<br>MPPUERSBF<br>2018. | Number of<br>municipaliti<br>es without<br>annual<br>report for<br>2018 |
|-----------|-----------------------------|---|--|---|---|
| Plovdiv   | 18                          | 1   | 8  | 8   | 1   |
| Pazarzhik | 12                          | 1   | 8  | 2   | 1   |
| Haskovo   | 11                          | 2   | 7  | 1   | 1   |
| Kardzhali | 7                           | -   | 5  | 2   | -   |
| Smolyan   | 10                          | 0-  | 8  | 2   | -   |
| Total     | 58                          | 4   | 36   | 15  | 3   |

The municipalities with operating MPPUERSBF for 2018 are 40 and 15 municipalities without operating MPPUERSBF.

| Cyprus Energy Agency |  |
|----------------------|--|
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 Implemented measures for RES in 2018 in the South Central Region - Implemented technical measures for production of RES

In 2018, the municipalities from the South Sentral Region of Bulgaria have implemented 9 technical measures in 4 districts, using 2 types of renewable energy sources - biomass and solar energy.

#### <u>Plovdiv Region</u>

| TypeofenergyRS | Type<br>produ<br>ced | Installed capacity | Production | Annual<br>Investme | Numbe<br>measure<br>s |
|----------------|----------------------|--------------------|------------|--------------------|-----------------------|
|                | energy               | kW                 | MWh/year   | Thousands          |                       |
| Biomass        | Therma<br>l          | 407                | 13         | 35                 | 1                     |
| Solar          | Therma<br>l          | -                  | 3          | 70,58              | 2                     |
| Total          |                      | 407                | 17         | 105,78             | 3                     |

For the utilization of solar energy and its conversion into heat energy, 4 units have been built. installations with a total installed capacity of 27.9 kW at a value of BGN 67.92 thousand:

- Construction of a solar installation for DHWS (domestic hot water supply) at Plovdiv Language High School - dormitory boys;
- Construction of a solar installation for DHWS (domestic hot water supply) at Plovdiv Language High School - dormitory girls;
- Solar installation for DHWS of Plovdiv Language High School educational building Plovdiv;
- Solar installation for DHWs of kindergarten "Zvezdichka", village of Stambolovo.

#### Pazardzhik Region

For the utilization of biomass and its conversion into thermal energy, an installation has been installed, burning pellets in the primary school "Konstantin Velichkov" in the village of Patalenitsa, Pazardzhik. For the utilization of solar energy and its conversion into thermal energy, 2 installations have been built-DHWS in kindergarten "First of June" and kindergarten "Raina Knyaginya"-Branch building-Panagyurishte; DHWS in kindergarten "Spring" - Panagyurishte.

#### Smolyan Region

For the utilization of biomass and its conversion into heat energy, an installation was built in the building of the Border Police Department in the town of Zlatograd. The total installed capacity is 30 kW, and the investment amounts to BGN 8,000 with an expected annual production of 30 MWh.

#### Kardzhali Region

For the utilization of solar energy and its conversion into electricity, 1 installation was built in municipality Kirkovo. The installed capacity is 4.6 kW and the investment amounts to BGN 42.6 thousand with an expected annual production of 40 MWh.

#### Haskovo Region

In 2018, no technical measures have been implemented in the district.

#### Total for SCR

| TypeenergyRS | Type<br>Produed | Installed capacity | Annual<br>production | Investments | Number<br>measures |
|--------------|-----------------|--------------------|----------------------|-------------|--------------------|
|              | energy          | k<br>W             | MWh/year             | Thous BG    |                    |
| Biomass      | Thermal         | 437                | 165                  | 43          | 2                  |
| Solar        | Thermal         | 27,88              | 35                   | 138,5       | 6                  |
| Solar        | Electric        | 4,6                | 40                   | 42          | 1                  |
| Total        |                 | 469,48             | 24                   | 224,1       | 9                  |

In 2018, the municipalities of the South-Central Region of Bulgaria have implemented 9 technical measures for production of RES with a total installed capacity of 469.48 MW.

From the applied measures for utilization of biomass and solar energy, in 2018 the production of a total of 240 MWh / year has started. Thermal energy is 200 MWh / year and electricity 40 MWh / year, annual production. In 2018, investments are focused on the production of heat and electricity from the sun - BGN 181.1 thousand (81%). BGN 43 thousand (19%) have been invested in the utilization of energy from biomass. The measures are funded by:

- The National Trust EcoFund (NTEF) BGN 68 thousand 0
- Programme BG04 BGN 8 thousand 0
- Other BGN 148 thousand 0

#### Evaluation of the effect of the implemented technical measures for production of RES in 2018.

The following tables show the assessment of the effect of the implemented technical measures for production of RES in 2018 in each area of the South Central Region of Bulgaria by type of renewable energy and produced energy, saved fuels and saved funds:

#### Haskovo Region

In 2018, no technical measures have been implemented in the region.

#### Pazardzhik Region

| Type<br>energyRES<br>produced | e of<br>Type of | Saved energy<br>fuels | Savings     | Saved<br>emissions CO2 | Number<br>measures |
|-------------------------------|-----------------|-----------------------|-------------|------------------------|--------------------|
|                               | energy          | MWh/year              | Thous /year | t/year                 |                    |
| Biomass                       | Thermal         | No data               | 12          | No data                | 1                  |
| Solar                         | Thermal         | 20,16                 | 7,66        | 16,51                  | 2                  |
| Total                         |                 | 20,16                 | 19,66       | 16,51                  | 3                  |

#### Plovdiv Region

| Type of energy from  | Type of produced | Saved energy<br>fuels | Savings      | Saved<br>emissions CO2 | Number<br>measures |
|----------------------|------------------|-----------------------|--------------|------------------------|--------------------|
|                      | energy           | MWh/yea               | Thous / year | t/year                 |                    |
|                      |                  | r                     |              |                        |                    |
| Solar                | Thermal          | 112,23                | 12,32        | 91,9                   | 4                  |
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Smolyan Region

| Type of energy from | Type of produced | Saved energy<br>fuels | Savings      | Saved<br>emissions CO | Number<br>measures |
|---------------------|------------------|-----------------------|--------------|-----------------------|--------------------|
|                     | energy           | MWh/year              | Thous / year | t/ye                  |                    |
| Biomass             | Thermal          | 27,5                  | 1,46         | 1,42                  | 1                  |

#### Kardzhali Region

| Type of<br>energy from | Type of<br>produced<br>energy | Saved energy<br>fuels | Savings      | Saved emission<br>CO2 | Number<br>measures |
|------------------------|-------------------------------|-----------------------|--------------|-----------------------|--------------------|
|                        |                               | MWh/year              | Thous / year | t/y                   |                    |
| Biomass                | Thermal                       | 40,3                  | No data      | 33,01                 | 1                  |

### Total SCR of Bulgaria

| Typ<br>energy from | e of<br>Type of<br>produced<br>energy | Saved energy<br>fuels | Savings     | Saved<br>emissions CO | Number<br>measures |
|--------------------|---------------------------------------|-----------------------|-------------|-----------------------|--------------------|
|                    |                                       | MWh/year              | Thous /year | t/y                   |                    |
| Biomass            | Thermal                               | 27,49                 | 1,46        | 13,62                 | 2                  |
| Solar              | Thermal                               | 132,39                | 31,98       | 96,42                 | 6                  |
| Solar              | Electric                              | 40,3                  | -           | 33,01                 | 1                  |
| Total              |                                       | 200,2                 | 33,44       | 143,0<br>5            | 9                  |

With the applied in 2018 technical measures for utilization of renewable energy, the municipalities of the South-Western Republic of Bulgaria have achieved a total of 200.2 MWh of annual energy savings, which is equal to BGN 33 thousand / year. savings and 143 tons / year saved CO2 emissions.

Comparison of the implementation of MPPUERSBF - Municipal Programme for Promotion of the Use of Energy from Renewable Sources and Biofuels in the South Central Region of Bulgaria in 2016, 2017 and 2018.

| Year | Number<br>municipalities | Municipalities<br>with operating<br>MPPUERSBF<br>until reporting<br>year | Municipalities<br>with operating<br>MPPUERSBF<br>after 2018. | Number of<br>municipalities<br>without<br>MPPUERSBF<br>2018. | Number of<br>municipalitie s<br>without<br>annual<br>reports |
|------|--------------------------|--|--|--|--|
| 2016 | 58                       | 4  | 23   | 20   | 7  |
| 2017 | 58                       | 1  | 34   | 19   | 4  |
| 2018 | 58                       | 4  | 36   | 15   | 3  |

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| Year | Installed<br>capacity | Annual production | Investments   | Number measures |
|------|-----------------------|-------------------|---------------|-----------------|
|      | kW                    | MWh/per year      | BGN Thousands | Number          |
| 2016 | 4 358,50              | 1 646,37          | 2 451,32      | 22              |
| 2017 | 1 985                 | 1 074             | 2 024         | 48              |
| 2018 | 469,48                | 240               | 224,10        | 9               |

## Implemented technical measures for production of RES

## Assessment of the effect of the implemented technical measures for production of RES

| Year | Saved<br>energy<br>fuels | Savings       | Saved emissions<br>CO2 | Number<br>measures |
|------|--------------------------|---------------|------------------------|--------------------|
|      | MWh/per year             | Thousand BGN. | Ton/per year           | Numbe<br>r         |
| 2016 | 1 068,73                 | 274,82        | 638,997                | 22                 |
| 2017 | 1 697                    | 187           | 983                    | 48                 |
| 2018 | 200                      | 33,44         | 143,05                 | 9                  |

# **Energy Performance Certificate**

The amendments to the Energy Efficiency Act explicitly set the requirement for energy efficiency certification of all buildings over 1000 m2, regardless of the type of their ownership. The purpose of energy efficiency certification of buildings is to verify the current state of energy consumption in buildings, energy performance and their compliance with energy consumption classes.

The issuance of a certificate is carried out on the basis of the results obtained from an inspection for energy efficiency, which must be performed by a licensed company under Art. 16 of the Act and must cover the entire building, not just individual parts of it. The energy performance certificate contains information on the specific energy consumption of the building, its "energy class", as well as a feasibility study of appropriate energy saving measures, including estimated return on investment.

Depending on the results of the examination, the certificates are issued with category "A", "B" or without category. The category is determined by comparing the energy performance of the building with the current energy efficiency standards and the standards in force during the year of commissioning of the building. Buildings put into operation after 2005 cannot receive an "A" or "B" certificate, because during construction they must meet the current standards.

If the issued certificate is of category "A" or "B", the owners will be exempt from building tax for 7 or 3 years, respectively. If the building has implemented measures for the introduction of renewable energy sources, these terms are extended to 10 and 5 years, respectively. When selling a building or parts of a building, the seller provides the buyer with the original of the energy performance certificate of the building, and when renting a copy of the certificate.

The current regulatory framework in the field (Ordinance N $_{\rm e}$  16-1594 of 13.11.2013 on energy efficiency inspection, certification and assessment of energy savings of buildings) defines two types of certificates - a certificate of design energy performance of the building before it is introduced in operation and certificates for energy performance of buildings in operation.

The certificate for design energy characteristics is issued after the completion of the construction of a new building before its commissioning or after the elaboration of the investment project before the issuance of a construction permit for the building (by order of the assignor / owner).

The second certificate is issued after an inspection, which takes into account how much energy the building consumes, what are the opportunities to reduce energy costs and what are the recommended

measures to optimize energy efficiency. The procedure ends with an assessment of energy savings - the result of the implementation of one or a group of measures aimed at increasing energy efficiency.

Inspection and certification of buildings can be performed only by experts - consultants on energy efficiency. They must meet certain requirements and be registered.

The energy efficiency inspection procedure is mandatory for public buildings that meet three conditions - to be state or municipal property, to be in operation and with a total built-up area of over 500 square meters. From July 9, 2015 the last requirement changes - the building must have a total built-up area of over 250 square meters.

The issuance of documents requires the contracting authority to provide the consultant in advance with an investment (executive) project; construction documents; the results of already performed tests of the enclosing structures, systems and elements in the building, as well as of the technical installations.

#### Energy efficiency audit

The energy performance audit of buildings includes the identification of building enclosures and elements and systems to ensure the microclimate, measurement and

calculation of energy performance, as well as analysis and determination of the potential for reducing energy consumption.

The next stage is the development of measures to increase energy efficiency, their feasibility study and assessment of saved carbon dioxide (CO2) emissions as a result of the implementation of the recommended measures.

The subject of the survey audit is also the analysis of the possibilities for the use of energy from renewable energy sources - part of the assessment of the annual energy consumption in the cooperative.

#### Certificate for design energy characteristics

The certificate for design energy characteristics contains data on the functional purpose of the building, location, photo of the building / computer graphics; the general geometrical characteristics, incl. the total built-up area, the heated area, the area of the cooled volume; class of energy consumption.

It also indicates the value of the integrated energy performance of the building and its reference value, expressed as a specific annual consumption of energy required in kWh / m2, and primary energy - in cases where it is calculated in the project of the building in kWh / m2; the net energy required in the absence of internal loads, as well as the gross energy required taking into account the internal loads in kWh / m2; the total annual consumption of required energy in MWh, the total annual consumption of primary energy in MWh - in the cases when it is calculated in the project of the building; the design value of carbon dioxide (CO2) emissions equivalent to the total annual energy consumption.

In the presence of such, the certificate also presents the energy from renewable sources in absolute value and as a relative share of the gross energy required for the building; the specific geometrical characteristics of the enclosing structures, their design energy characteristics, incl. their reference values.

Sources of energy in the building are described, including renewable, the energy performance values of the microclimate systems, expressed as a specific annual energy consumption for heating, ventilation and cooling in kWh / m2. The issued certificate also provides information on the value of the specific annual energy consumption of the domestic hot water system, in kWh / m2, and the energy sources used, incl. renewable.

#### Inspection /Audit of buildings in operation

The inspection of buildings in operation covers the following technical means and systems: the means for measuring and controlling the energy flows in the building; fuel combustion systems and conversion of energy flows entering the building, incl. from renewable sources; heat transfer systems - water, steam condensate, air; power supply systems; lighting systems; microclimate systems; domestic hot water systems and building enclosing structures and elements.

#### Stages of audit

In the first, the so-called preparatory stage of the survey, the building is inspected, the primary information about its operation and energy costs for a representative previous period of time are collected and processed.

The second stage includes a more detailed analysis of the existing condition and energy consumption of the building, preparation of energy balances and determination of the baseline of energy consumption. As a result, the energy performance of the building and the potential for their improvement are determined.

In the third stage of the audit, specific measures to increase energy efficiency are developed and the annual amount of energy savings is determined, as well as the amount of CO2 emissions saved. The final phase of the audit envisages the preparation of a report reflecting the results of the inspection and providing it to the owner of the building.

#### Term of validity of the certificate

For buildings in operation, the energy performance certificate has a 10-year validity period. The next certificate must be issued within one year after the expiry of the previous one.

The certificate is updated with the issuance of a new certificate in all cases of activities leading to the improvement of the overall energy performance of the building, such as reconstruction, major renovation, overhaul or reconstruction of the building, maintenance of building installations and other activities.

According to the ordinance, in case of changes in the conditions under which the certificate is issued, as well as in case of change of the circumstances reflected in it, the owner of the building should perform a new inspection/audit for energy efficiency and certification of the building.

The owner of the building or the assignor of the procedure is obliged not later than 30 days from the commissioning of the new building to submit to the Agency for Sustainable Energy Development a certified copy of the certificate for design energy performance.

#### Tax exemption

A special scale of energy consumption classes defines buildings - from the high-efficiency class A to the lowest-efficiency class G. The Law on Local Taxes and Fees provides for buildings with a certificate of energy performance category "A" or "B" to be exempt from tax for a period up to 10 years.

The preference starts from the year following the date of issue of the certificate. If the certificate is of category "A", the exemption from building tax is for a period of seven years. If measures related to the use of renewable energy sources are applied in the building, this period shall be extended to ten years.

In the case of a certificate for a building of category "B", the exemption from building tax is for a period of 3 years. In case of introduced measures for use of renewable energy sources this term becomes five years. The tax exemption for buildings (because of their energy efficiency certification) applies only if the properties are not used for commercial purposes.

However, the tax relief applies only to buildings put into operation before 1 January 2005. The reason is that the new construction is subject to mandatory rules and standards for energy efficiency and therefore in full compliance with legal norms.

## D3.1

# **SECTION 3**

# 3. Stakeholders Relevant to Energy Efficiency of Public Buildings

# 3.1. Region of Epirus and Regional Unit of Thesprotia & Region of

## Sterea Ellada and Regional Unit of Evia

Identification and participation of stakeholders is of vital importance for the successful implementation of a long-term strategy for the energy renovation of buildings. The following figure shows the key factors involved in the decision-making process for the renovation of a building.



FIGURE 15 : KEY FACTORS INVOLVED IN THE DECISION-MAKING PROCESS FOR THE RENOVATION OF BUILDINGS

According to the "National Report on long-term strategy for mobilizing investment in the renovation of the national stock of residential and commercial buildings, both public and private", there is a number of ministries, public bodies and institutions which are directly or indirectly associated with the energy upgrade of buildings in Greece (in terms of policy measures, financial tools, technical assistance, market monitoring etc.).

By applying the LFA's (Logical Framework Approach) methodological tool of stakeholders' matrix, the stakeholders relevant to energy efficiency of public buildings in the Region of Epirus and the Regional Unit of Thesprotia are presented to the following table.

#### TABLE 13: STAKEHOLDERS' MATRIX

| Stakeholder  | Interests and how   | Opportunities &  | Possible Actions  |
|--|---|--|---|
| Category &   | they are affected   | Incentives for   |   |
| Key Features   | by the project  | Change   |   |
| Central<br>Government<br>Bodies<br>• Ministry of<br>Environment<br>and Energy<br>• Ministry of<br>Transport<br>and<br>Infrastruct<br>ures<br>• Ministry of<br>Finance<br>• Ministry of<br>the Interior<br>• Ministry of<br>Development<br>and<br>Investments<br>• Ministry of<br>Education<br>and<br>Religious<br>Affairs<br>• Ministry of   | <ul> <li>Develop<br/>energy<br/>policies and<br/>interventions</li> <li>Manage /<br/>implement /<br/>coordinate<br/>Sectoral and<br/>Regional<br/>Operational<br/>Programs of the<br/>NSRF that include<br/>actions related to<br/>energy</li> </ul>  | <ul> <li>Political influence</li> <li>Decision-<br/>making power</li> <li>Financial resources</li> </ul> | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> <li>Mobilizing<br/>representatives/<br/>associations of<br/>citizens and<br/>corporations to<br/>influence them</li> </ul> |
| Health<br>Regional and<br>Municipal<br>Authorities<br>• Region of Epirus<br>• Decentralized<br>Administration<br>of Epirus and<br>Western<br>Macedonia<br>• Regional<br>Unit of<br>Thesprotia<br>• Municipalities<br>of Thesprotia<br>Regional Unit<br>• Region of<br>Sterea Ellada<br>• Decentralized<br>Administration<br>of Thessaly and<br>Sterea Ellada<br>• Regional Unit of<br>Evia<br>• Municipalities<br>of Evia Regional<br>Unit<br>• Municipalities<br>of Evia Regional<br>Unit | <ul> <li>Develop<br/>energy<br/>policies and<br/>interventions</li> <li>Own and<br/>manage public<br/>sector buildings</li> <li>Manage /<br/>implement /<br/>coordinate<br/>Regional<br/>Operational<br/>Programs of the<br/>NSRF that<br/>include actions<br/>related to<br/>energy</li> </ul> | <ul> <li>Political influence</li> <li>Decision-making power</li> <li>Financial resources</li> </ul>      | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> <li>Mobilizing<br/>representatives/<br/>associations of<br/>citizens and<br/>corporations to<br/>influence them</li> </ul> |

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| other Regional<br>Units of Sterea<br>Ellada   |  |  |   |
|---|--|--|---|
| Public<br>Companies<br>• Hellenic<br>Public<br>Properties<br>Company<br>(HPPC) S.A.<br>• Building<br>Infrastruct<br>ures<br>(KTYP)<br>S.A.<br>• Developme<br>nt Agency<br>of Evia | • Own and<br>manage public<br>sector buildings | • Decision-<br>making power  | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> <li>Mobilizing<br/>representatives/<br/>associations of<br/>citizens and<br/>corporations to<br/>influence them</li> </ul> |
| S.A.<br>Institutions<br>• Technical   | Develop     operav                             | • Technical<br>Guidance/assistan   | <ul> <li>Increasing their<br/>information through</li> </ul>  |
| Chamber of<br>Greece<br>• Centre for<br>Renewable<br>Energy<br>Sources<br>• Research<br>Institutions<br>(e.g.<br>National   | energy<br>policies and<br>interventions        | Decision-<br>making power  | <ul> <li>Monitation through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> <li>Mobilizing<br/>representatives/<br/>associations of citizens to<br/>influence them</li> </ul>  |
| Observatory<br>of Athens)<br>• Academic<br>Institutions<br>(e.g.<br>University of<br>Ioannina,<br>Technologic   |  |  |   |
| al<br>Educational,<br>Institute of<br>Epirus,<br>University of<br>Thessaly,<br>Technologic<br>al  |  |  |   |
| Educational<br>Institute of<br>Sterea<br>Ellada)  |  |  |   |
| Associations<br>• Associations of<br>real estate<br>owners (e.g.<br>Hellenic<br>Property<br>Federation)   | Building owners                                | <ul> <li>Decision-<br/>making power</li> <li>Technical<br/>Guidance/assistan<br/>ce</li> </ul> | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> </ul>  |

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| of property<br>developers<br>(e.g.<br>Federation<br>of Property<br>Developers<br>and<br>Constructio<br>n               |  |  | <ul> <li>Mobilizing<br/>representatives/<br/>associations of<br/>citizens and<br/>corporations to<br/>influence them</li> </ul>  |
|--|--|--|--|
| Companies)<br>Environmental<br>NGOs<br>• Greenpeace<br>• WWF<br>• INZEB<br>• Hellenic<br>Passive<br>House<br>Institute | • Develop<br>energy<br>policies and<br>interventions   | • Technical<br>Guidance/assistan<br>ce | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> <li>Mobilizing<br/>representatives/<br/>associations of<br/>citizens to influence<br/>them</li> </ul> |
| Private Entities<br>• Energy Service<br>Companies<br>(ESCOs)<br>• Banks and<br>Financial<br>Institutions               | <ul> <li>Implement<br/>energy<br/>efficiency<br/>interventions</li> <li>Funding resources</li> </ul> | • Financial Resources                  | <ul> <li>Increasing their<br/>information through<br/>conferences, public<br/>consultations,<br/>bilateral meetings,<br/>etc.</li> </ul>   |

# 3.2. Cyprus

The major stakeholders (State, Private, and Civil) have been mapped as key, primary, and secondary, as presented in the following table. The role of each key stakeholder for the effort of promoting energy efficiency in public buildings in Cyprus has been defined. The stakeholders mapping is important as it gives a clearer picture of the competences and roles.Regarding the Government (State), are several departments that are involved either in the policymaking of climate and energy and/or in the financing sector as shown in the table below.

The key state actors regarding the implementation of the National Energy and Climate Plan (NECP) are the Ministry of Energy, Commerce & Industry (MECI), and Ministry of Agriculture, Rural Development & the Environment (MARDE).

Specifically, the Energy Service is the Service that operates under the MECI and has the role of monitoring the implementation of the National Policies related to energy efficiency, energy efficiency in buildings, biofuels, and fuels. Also, Energy Service makes suggestions and recommendations about possible support schemes and mechanisms to promote those topics.

Moreover, the Directorate General of European Programmes, Cooperation, and Development (DG EPCD) and Ministry of Finance (MoF) can play a clear role. Regarding the primary actors, the Cyprus Scientific and Technical Chamber (ETEK) which is the technical advisor to the State and the umbrella organization for all Cypriot engineers plays a clear role, as well as the Union of Cyprus Municipalities and the Union of Cyprus Communities which are the main associations representing the Local Authorities in Cyprus.

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In addition, The Department of Electrical and Mechanical Services and the Department of Public Works are Government Departments, part of the Ministry of Transport, Communication and Works, which play a significant role in the improvement of energy efficiency of public buildings. Specifically, the Department of Electrical and Mechanical Services is responsible for the planning, design, execution, and maintenance of most governmental electrical and mechanical projects, as well as, for the purchase, maintenance and efficient utilization of the governmental machinery, equipment, and vehicle fleet. Finally, State universities play a significant role as secondary actors.

Regarding the private sector, key actors include businesses and associations of businesses, such as the Cyprus Energy Efficiency Businesses Association (represents companies active in the field of energy-saving and energy services companies (ESCO)), the Cyprus Building Contractors Association, the Mechanical & Electrical Contractors Association of Cyprus and, of course, the Cyprus Employers & Industrialists Federation (OEB), which is the representative organization of SMEs covering all sectors of the economy. Private universities and other research institutes also play a role but as secondary actors. When it comes to Civil Society, the non-governmental organizations (NGOs) play a role as primary actors. The most relevant NGO is the Cyprus Energy Agency which enhances the role of local authorities in sustainable energy planning, providing technical support for developing and implementing actions to promote energy efficiency. Finally, the role of energy auditors and Energy Saving Officers is also very important.

| I ABLE 14: STAKEHOLDERS MAPPING IN CYPRUS |  |
|---|--|
|   |  |

|                           | State   | Private sector  | Civil society  |
|---------------------------|---|---|--|
| Key<br>stakeholders       | <ul> <li>Ministry of Energy, Commerce &amp; Industry (MECI)</li> <li>Ministry of Agriculture, Rural Development &amp; the Environment (MARDE)</li> <li>Directorate General of European Programmes, Cooperation, and Development (DG EPCD)</li> <li>Ministry of Finance (MoF)</li> </ul> | <ul> <li>Cyprus Energy<br/>Efficiency<br/>Businesses<br/>Association</li> <li>Cyprus Building<br/>Contractors<br/>Association</li> <li>Mechanical &amp;<br/>Electrical<br/>Contractors<br/>Association</li> </ul> |  |
| Primary<br>stakeholders   | <ul> <li>Cyprus Scientific and<br/>Technical Chamber (ETEK)</li> <li>Union of Cyprus Municipalities</li> <li>Union of Cyprus Communities</li> <li>Department of Electrical and<br/>Mechanical Services</li> <li>Department of Public Works</li> </ul>                                   | <ul> <li>Cyprus Employers &amp;<br/>Industrialists<br/>Federation (OEB)</li> </ul>  | <ul> <li>NGOs (Cyprus<br/>Energy Agency)</li> <li>Energy Saving<br/>Officers of<br/>public buildings</li> <li>Energy auditors</li> </ul> |
| Secondary<br>stakeholders | <ul> <li>Universities (the University of<br/>Cyprus, Cyprus University of<br/>Technology)</li> </ul>  | <ul> <li>Universities<br/>(University of<br/>Nicosia, European<br/>University,<br/>Frederick)</li> <li>Other research<br/>institutes (Cyprus<br/>Institute)</li> </ul>  |  |

# 3.3. Bulgaria

At national level:

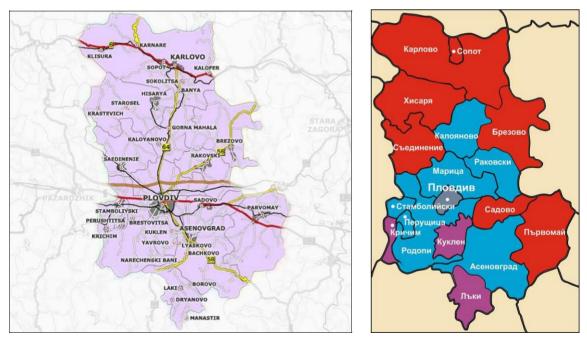
- Sustainable Energy Development Agency (SEDA is a legal entity at state budget support with headquarters in Sofia and has the status of an executive agency within the Ministry of Energy)
- Association of Bulgarian Energy Agencies
- Ministry of Regional Development and Public Works

At regional legel - South Central Planning Region (NUTS 2)



- Ministry of Regional Development and Public Works General Directorate "Strategic Planning and Programmes for Regional Development Department "South Central Region"
- $\circ$   $\;$  Council of Regional Development of South Central Region
- 5 Regional governors of Plovdiv, Pazardzhik, Smplyan, Haskovo, Kardzhali (NUTS 3) ,BG421 Plovdiv Region; BG422 Haskovo Region; BG423 Pazardzhik Region; BG424 Smplyan Region; BG425 Kardzhali Region
- o 5 Regional Administrations of Plovdiv, Pazardzhik, Smplyan, Haskovo, Kardzhali

At regional level - Plovdiv Region (NUTS 3) - BG421



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|            |     |      |

All 18 municipaities: Asenivgrad, Brezovo, Kaloyanovoo, Karlovo, Lucky, Martista, Plovdiv,

Parvomai, Rakovski, Dodopi, Sadovo, Saedinenie, Hissar, Kritchim, Perustista, Stamboliyski,

Kuklen, Sopot

At municipal level:

- Plovdiv municipality 0
- Mayor of Plovdiv
- Municipal Council
- Energy Agency Plovdiv https://www.eap-save.eu/
- Regional Energy Agency Pazardjik http://reap-bg.eu/home.html
- Regional Council for sustainable energy development of Plobdiv region 0
- o SEDA Regional reprsentative Plovdiv

Universities:

- University of Food Technologies Plovdiv
- Technical University Sofia branch Plovdiv

#### Companies:

- EVN Trading South East Europe JSCo
- EVN Bulgaria District Heating JSCo Energy Policy and Environment Department
- CityGas Bulgaria JSCo
   EVN Trading South East Europe
- EVN Bulgaria EAD Energy Policy and Environment Department
- Regional Construction Chamber Plovdi

# **SECTION 4**

# 4. Analysis of Energy Efficiency Investments in the area, mapping of policies, interventions, and initiatives

# 4.1. Region of Epirus and Regional Unit of Thesprotia & Region of Sterea Ellada and Regional Unit of Evia

# **Investments of Energy Efficiency**

The National Strategic Reference Framework 2014-2020 (NSRF) constitutes the main strategic plan for growth in Greece, involving the contribution of significant resources originating from the European Structural and Investment Funds (ESIF) of the European Union. The NSRF 2014- 2020, through its implementation, seeks to tackle a series of structural weaknesses in Greece as well as other economic and social problems caused by the long year financial crisis. Moreover, it is called upon to help attain the national targets under the prism of the Europe 2020 Strategy.

Within this framework, the Region of Epirus has conducted its Operational Program for the period 2014-2020, with a total budget of approx.  $\notin$  337.1 mn. The latter foresees both as a Strategic Target and as a Priority Axis (PA 2) the "Environmental Protection and Sustainable Development" and as a Thematic Objective (TO 4) "To support the shift towards a low carbon economy in all sectors". The total budget of PA2 amounts to  $\notin$  132.2 mn.

Within this framework, the Region of Sterea Ellada has conducted its Operational Programme for the period 2014-2020, with a total budget of  $\in$  190 mn. The latter foresees as a Priority Action (PA 4) the "Support towards the transition to a low carbon economy in all sectors", which counts for the 7.68% of the total budget.

Moreover, the Program sets as an Investment Priority (IP 4c) the "Support for energy efficiency, smart energy management and the use of renewable energy sources in public infrastructure, including public buildings, and in the housing sector".

According to the latest available data, occurring from the ANAPTYXI.gov.gr, which is the official website of the Ministry of Economy and Investments that provides detailed information on the progress of the implementation of the NSRF 2014-2020, a total budget of approx.  $\in$  166 mn. (occurring from the sum of NSRF operational -regional and sectoral - programs) refers to projects in the Region of Epirus under the thematic target of "Supporting the shift towards a low carbon economy in all sectors", out of which approx.  $\in$  2.9 mn. refer to enhancing energy infrastructure in the Regional Unit of Thesprotia. The state of play of the currently approved/contracted projects and grants for the Region of Epirus is presented to the following table 14. In regard the Region of Sterea Ellada, a total budget of approx.  $\notin$  84 mn. (occurring from the sum of NSRF operational - sectoral and regional - Programmes) refers to projects in the Region of Sterea Ellada under the thematic target of "Supporting the shift towards a low carbon economy in all sectors", out of which approx.  $\notin$  2.6 mn. refer to enhancing energy infrastructure to the following table 14. In regard the Region of Sterea Ellada, a total budget of approx.  $\notin$  84 mn. (occurring from the sum of NSRF operational - sectoral and regional - Programmes) refers to projects in the Region of Sterea Ellada under the thematic target of "Supporting the shift towards a low carbon economy in all sectors", out of which approx.  $\notin$  2.6 mn. refer to enhancing energy infrastructure in the Regional Unit of Evia. The state of play of the currently approved/contracted projects and grants for the Region of Sterea Ellada is presented to the table.

# NSRF PROJECTS/GRANTS (THEMATIC OBJECTIVE "ECO-ECONOMY") - REGION OF EPIRUS- [SOURCE: MINISTRY OF ECONOMY & INVESTMENTS - ANAPTYXI.GOV]

|         | Title  | Beneficiary   | Budget       |
|---------|--|---|--------------|
| 5049255 | Upgrading Buildings and Improving Energy Efficiency in the Home Building<br>Industry - Second Cycle                | HELLENIC DEVELOPMENT<br>BANK S. A.                        | 25,000,000 € |
| 5027228 | Upgrading buildings and improving energy efficiency in the residential<br>building sector                          | HELLENIC DEVELOPMENT<br>BANK S. A.                        | 4,500,000 €  |
| 5032929 | Actions for upgrading the energy efficiency of the University Hospital of<br>loannina                              | UNIVERSITY HOSPITAL OF<br>IOANNINA                        | 4,436,904 €  |
| 5045467 | Energy performance improvement of building comlpex of 1st Secondary - 1st<br>High School of Igoumenitsa            | MUNICIPALITY OF<br>IGOUMENITSA                            | 1,753,157 €  |
| 5029524 | Energy Upgrading of the Sports Hall in the 1st Lyceum of the Municipality of<br>Preveza                            | MUNICIPALITY OF PREVEZA                                   | 1,658,693 €  |
| 5052248 | LED LIGHT INSTALLATION IN THE CITY OF ARTA   | MUNICIPALITY OF ARTEON                                    | 1,523,000 €  |
| 5029516 | Energy upgrading Interventions at the PEAKI indoor swimming center of<br>loannina                                  | GENERAL SECRETARIAT OF<br>SPORTS                          | 1,460,395€   |
| 5050490 | New energy efficient vehicles in the municipality of Preveza   | MUNICIPALITY OF PREVEZA                                   | 1,000,680 €  |
| 5052624 | New energy efficient vehicles in municipality of Igoumenitsa   | MUNICIPALITY OF<br>IGOUMENITSA                            | 999,998 €    |
| 5050123 | Vehicles replacement with new energy efficient and low-emission ones in the<br>municipality of loannina            | MUNICIPALITY OF IOANNINA                                  | 999,892€     |
| 5029554 | Energy Upgrade of the Municipal Swimming Center of Arta  | MUNICIPALITY OF ARTEON                                    | 998,820 €    |
| 5052654 | SUPPLY OF MUNICIPAL ENERGY EFFICIENT VEHICLES  | MUNICIPALITY OF ARTEON                                    | 985,800 €    |
| 5047142 | Building upgrade and energy efficiency improvement of public buildings in<br>the municipality of Arta - PHASE A'   | MUNICIPALITY OF ARTEON                                    | 960,000 €    |
| 5047063 | ENERGY UPGRADE OF THE SCHOOL BUILDINGS IN THE MUNICIPALITY OF<br>ZITSA   | MUNICIPALITY OF ZITSA                                     | 950,000 €    |
| 5050501 | INTEGRATED INTERVENTION ON THE INFRASTRUCTURE OF TRAFFIC<br>LIGHTS IN THE MUNICIPALITY OF IOANNINA                 | MUNICIPALITY OF IOANNINA                                  | 830,000 €    |
| 5047109 | ENERGY UPGRADE AND CONSTRUCTION WORKS OF THE BUILDING OF THE<br>CENTER OF MENTAL HEALTH FOR CHILDREN AND TEENAGERS | UNIVERSITY HOSPITAL OF<br>IOANNINA                        | 660,310 €    |
| 5052664 | SUPPLY OF ENERGY EFFICIENT VEHICLE FOR THE NEEDS OF ARTA' S<br>MUNICIPAL ENTERPRISE FOR WATER SUPPLY AND SEWERAGE  | MUNICIPAL WATER SUPPLY<br>AND SEWERAGE COMPANY OF<br>ARTA | 570,400 €    |
| 5005002 | Development of an air pollution measuring system   | REGION OF EPIRUS  | 165,223 €    |
| 5000627 | action plan for sustainable energy ( sdve ) municipality of ioannina   | MUNICIPALITY OF IOANNINA                                  | 156,860 €    |
| 5000641 | Study for an action plan for sustainable energy in the municipality of arta  | MUNICIPALITY OF ARTEON                                    | 127,374 €    |
| 5000552 | Development of the sustainable energy action plan of the municipality of<br>preveza                                | MUNICIPALITY OF PREVEZA                                   | 115,791 €    |

# NSRF PROJECTS/GRANTS (THEMATIC OBJECTIVE "ECO-ECONOMY") - REGION OF STEREA ELLADA- [SOURCE: MINISTRY OF ECONOMY & INVESTMENTS - ANAPTYXI.GOV]

|         | Title  | Beneficiary                         | Budget      |
|---------|--|-------------------------------------|-------------|
| 5029543 | Improving Energy Efficiency and the use of more energy-friendly forms of<br>energy in private buildings, complementary to the relevant action of the<br>EPANEK | HELLENIC DEVELOPMENT<br>BANK S. A.  | 3,100,000 € |
| 5029470 | Energy Upgrading of the "Tassos Kabouris" indoor sports center of Chalkida   | MUNICIPALITY OF HALKIDA             | 2,300,000 € |
| 5028327 | Energy upgrade of Karpenisi indoor swimming pool   | MUNICIPALITY OF KARPENISI           | 1,471,939 € |
| 5029465 | Energy efficiency upgrade of "Panayiotis Moros" municipal sports center of<br>the Municipality of Karystos   | MUNICIPALITY OF KARISTO             | 1,133,911 € |
| 5039869 | Energy Saving and Application Technologies SA at the General Hospital of<br>Karpenissi   | REGION OF CENTRAL GREECE            | 1,128,447 € |
| 5029479 | Energy upgrading of "Andreas Errikos Hatzopoulos" indoor Municipal Gym in<br>the Municipality of Thebes  | MUNICIPALITY OF THIVA               | 815,365€    |
| 5029518 | Energy upgrading of "Halkiopoulion" indoor sports hall of Lamia  | MUNICIPALITY OF LAMIA               | 745,700 €   |
| 5029292 | Interventions for energy upgrading and energy saving at the indoor basketball<br>hall of the Municipality of Skyros  | MUNICIPALITY OF SKIROS              | 693,000 €   |
| 5038600 | ENERGIAKI ANAVATHMISI SCHOLIKIS MONADAS EPAL LIVADIAS  | MUNICIPALITY OF LEVADEON            | 649,514 €   |
| 5044908 | ENERGY REFURBISHMENT OF SECONDARY SCHOOL OF ISTIEA   | MUNICIPALITY OF ISTIEA -<br>EDIPSOS | 605,685€    |
| 5041835 | ENERGY UPGRADE OF THE 1st & THE 17th PRIMARY SCHOOLS & THE 17th<br>NURSERY SCHOOL OF LAMIA   | MUNICIPALITY OF LAMIA               | 489,244 €   |
| 5038582 | ENERGY UPGRADE FIRST MIDDLE SCHOOL OF ORCHOMENOS   | MUNICIPALITY OF<br>ORCHOMENOS       | 450,000 €   |
| 5041823 | ENERGY UPGRADE SECOND MIDDLE SCHOOL OF ORCHOMENOS  | MUNICIPALITY OF<br>ORCHOMENOS       | 370,500 €   |
| 5021774 | Energy upgrading of outdoor swimming pool in Itea, Municipality of Delphi  | MUNICIPALITY OF DELFI               | 337,307 €   |
| 5041825 | ENERGY UPGRADE TOUWN HALL OF ORCHOMENOS  | MUNICIPALITY OF<br>ORCHOMENOS       | 283,080 €   |
| 5038586 | INTERVENTIONS FOR THE ENERGY UPGRADING AND ENERGY SAVING AT<br>THE HIGH SCHOOL OF SKYROS   | MUNICIPALITY OF SKIROS              | 197,160 €   |
| 5042920 | UPGRADING ENERGY EFFICIENCY AND SAVINGS OF ACTIVITY IN JUNIOR<br>JUNIOR HIGH SCHOOL OF THE MUNICIPALITY OF THEBES  | MUNICIPALITY OF THIVA               | 192,550 €   |

# Mapping of Policies

## • Relevant EU Directives

The European Union is committed to developing a sustainable, competitive, secure, and decarbonized energy system by 2050. To meet that goal, Member States and investors need measures that aim to reach the long-term greenhouse gas emission goal and to decarbonize the building stock, which is responsible for approximately 36 % of all CO2 emissions in the Union, by 2050.

The articles of the aforementioned Directives that directly affect the public sector are described in the following table.

| Directive   | Article  | Description   |
|---|--|---|
|   |  |   |
| Energy Efficiency<br>Directive<br>(2012/27/EU)                  | Article 5 - Exemplary role of<br>public bodies' buildings  | 3 % of the total floor area of heated and/or cooled buildings owned and occupied by its central government is renovated each year.  |
|   | Article 6 - Purchasing by<br>public bodies                 | Central governments purchase only products, services and buildings with high energy-efficiency performance  |
|   | Article 7 - Energy efficiency<br>obligation schemes        | Each Member State shall set up an energy<br>efficiency obligation scheme and ensure to<br>achieve a cumulative end-use energy<br>savings target. To attain the cumulative<br>target, measures in the public sector could<br>be included.                |
|   | Article 18 - Energy services                               | The Member States shall support the public sector in taking up energy service offers, in particular for building refurbishment  |
| Energy Performance<br>of Buildings<br>Directive<br>(2010/31/EU) | Article 9 - Nearly zero-energy<br>buildings                | The Member States shall ensure that after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.  |
|   | Article 12 - Issue of energy<br>performance certificates   | An EPC is issued for buildings where a total useful floor area over $500 \text{ m}^2$ is occupied by a public authority and frequently visited by the public. On 9 July 2015, this threshold of $500 \text{ m}^2$ shall be lowered to $250 \text{ m}^2$ |
|   | Article 13 - Display of energy<br>performance certificates | Public authorities that frequently visited by<br>the public, must ensure that the EPC is<br>displayed in a prominent place clearly<br>visible to the public.  |

TABLE 15: EU DIRECTIVES' ARTICLES THAT AFFECT THE PUBLIC SECTOR- [SOURCE: CYPRUS ENERGY AGENCY]

Member States should seek a cost-efficient equilibrium between decarbonizing energy supplies and reducing final energy consumption. To that end, the Member States and investors need a clear vision to guide their policies and investment decisions, which includes indicative national milestones and actions for energy efficiency to achieve the short-term (2030), mid-term (2040) and long-term (2050) objectives in conjunction with the 2020 objectives (2018/844/EU) (European Union, 2018).

With those objectives in mind and considering the Union's overall energy efficiency ambitions to boost the energy performance of buildings, the EU has established a legislative framework that includes the Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy

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efficiency. Both Directives were amended, as part of the Clean Energy for all European package, in 2018 and 2019, respectively. In particular, the Directive amending the Energy Performance of Buildings Directive (2018/844/EU) introduces new elements and sends a strong political signal on the EU's commitment to modernize the buildings sector considering technological improvements and increase building renovations (European Commission, 2020).

The Directive amending the energy efficiency (2018/2002/EU) establishes the EU energy efficiency target for 2030 of at least 32.5% (compared to projections), with a clause for a possible upwards revision by 2023. Over the years, the European Commission has published guidance notes to help EU countries to transpose fully the different elements these Directives into national law.

• National Implementation of EU Directive and other relevant National Regulation

The EU Directive 2010/31/EU has been initially implemented in Greek Legislation through the Law 4122/2013, which has been partially revised through the Law 4685/2020.

The provisions of Law 4122/2013 include, among others:

- The conduction of a Long-term Strategy for Energy Refurbishment of all public and private buildings.
- $\circ$  The framework for setting out the energy efficiency minimum requirements through KENAK.
- The mandate, starting from 01.01.2019, for all the new public sector buildings to be near zero energy consumption.
- The issuance of Energy Performance Certificates for all public sector buildings of more than 250 m2 total floor surface, in which regular interaction with the public takes place.
- The mandate for the Energy Performance Certificates of public buildings to be posted in public view.
- The initiation of measures, funding programs and other means to improve the energy efficiency of new and existing buildings. Incentives shall consider the cost- effectiveness of energy efficiency investments for society as a whole.

Furthermore, the Directive 2012/27 has been initially implemented in Greek Legislation through the Law 4342/2015, which has been partially revised through the Law 4713/2020.

According to the provisions of Law 4342/2015:

- An indicative National Target of Energy Efficiency has been set (Article 4 of the Law in accordance with Article 3 of the Directive)
- It renders mandatory for the State to proceed with the energy refurbishment of the 3% of public sector buildings in terms of covered surface (Article 7 of the Law in accordance with Article 5 of the Directive)
- Yearly targets of energy efficiency (ktoe) have been set for the period 2015-2020 (Article 9 of the Law in accordance with Article 7 of the Directive)
- The framework for the conduction of energy audits was legislated (Article 10 of the Law in accordance with Article 8 of the Directive)

- A framework is set up for safeguarding the accuracy and validity of metering and billing information to the final consumer of electricity, gas and heating / district heating (Articles 11 & 12 of the Law in accordance with Articles 9-11 of the Directive)
- A series of measures regarding the enhancement of general public concerning the benefits of energy efficiency actions for households have been enacted (Articles 13 & 18 of the Law in accordance with Articles 12 & 17 of the Directive)
- $\circ$  A certification framework was set for energy auditors and for public sector buildings'
- energy managers (Article 17 of the Law in accordance with Article 16 of the Directive)
- A national record for energy service companies (ESCOs) was created (Article 19 of the Law in accordance with Article 18 of the Directive)
- A horizontal support measures scheme has been legislated (Article 20 of the Law in accordance with Articles 19-20 of the Directive)

# **Interventions and Initiatives**

As described in the latest annual progress report of the National Action Plan for Energy Efficiency, a series of interventions and initiatives have taken place at national level in order to enhance Energy Efficiency during the period 2014-2016.

 TABLE 16 : ENERGY EFFICIENCY (KTOE) FROM INTERVENTIONS APPLIED DURING 2014-2016 - [Source: National Action Plan for Energy Efficiency]

| Policy Measure<br>/ Initiative   | Number of<br>Interventions | 2014  | 2015  | 2016  |
|--|----------------------------|-------|-------|-------|
| "Exoikonomo"<br>Program for<br>Residence<br>Buildings                            | 26,164 buildings           | 21.98 | 8.17  | 1.55  |
| "Exoikonomo"<br>Program for<br>Municipalities                                    | 59 Municipalities          | -     | -     | 2.25  |
| "Exoikonomo<br>II" Program for<br>Municipalities                                 | 14 Municipalities          | -     | 0.05  | 0.17  |
| Replacing of old<br>light and heavy<br>tracks of public and<br>private<br>sector | 10,952 vehicles            | 4.17  | 5.12  | 3.14  |
| Replacing of old<br>transport vehicles<br>of<br>private sector                   | 165,778 vehicles           | 28.27 | 29.86 | 17.13 |
| "ЕППЕРАА"<br>Actions   | -                          | 0.24  | 1.24  | 11.66 |

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| AthensMetro<br>Expansion                       | -   | 29.30 | -    | -    |
|--|---|-------|------|------|
| Offsetting fines<br>for arbitrary<br>buildings | 522 buildings                               | 0.00  | 0.13 | 0.50 |
| Energy<br>Managers                             | 204 buildings                               | -     | -    | 1.19 |
| Energy<br>Performance<br>Certificates          | 5,724 Energy<br>Performance<br>Certificates | 2.09  | 3.51 | 2.26 |

Furthermore, additional actions have been put in place for the years 2017-2020 as presented to the following table.

TABLE 17: ENERGY EFFICIENCY (KTOE) FROM INTERVENTIONS DECIDED TO APPLY DURING 2017-2020 - [SOURCE: NATIONAL ACTION PLAN FOR ENERGY EFFICIENCY]

| Policy Measure / Initiative   | 2017  | 2018  | 2019  | 2020  |
|---|-------|-------|-------|-------|
| "Exoikonomo" Program for<br>Residence Buildings                                     | 7.19  | -     | -     | -     |
| Residence Buildings' Energy<br>Refurbishment Actions                                | -     | 25.04 | 18.78 | 18.78 |
| Public Buildings' Energy<br>Refurbishment Actions                                   | -     | 7.14  | 7.14  | 7.14  |
| Energy Efficiency<br>Demonstration Projects   | -     | 3.01  | 3.01  | 3.01  |
| Application of energy management<br>system (based<br>on ISO 50001) on public sector | -     | 1.19  | 1.19  | -     |
| Commercial Buildings' Energy<br>Refurbishment Actions<br>through EPC schemes        | -     | -     | 0.85  | 0.85  |
| Development of intelligent<br>systems for energy<br>management                      | 1.39  | -     | 6.30  | 6.30  |
| "ЕППЕРАА" Actions   | 6.31  | -     | -     |       |
| Energy Managers and Action<br>Plans for public sector's<br>buildings                | 8.39  | 76.13 | 84.53 | -     |
| Energy Performance<br>Certificates  | 2.62  | 2.62  | 2.62  | 2.62  |
| Street lighting Networks<br>Upgrade   | -     | 10.00 | -     | -     |
| Pumping Stations Upgrade  | -     | -     | 4.00  | 2.00  |
| Enforcement Regimes   | 25.00 | 44.33 | 33.50 | 33.00 |

Moreover, an ambitious strategy has been adopted by the Greek Authorities for the renovation of

To promote the renovation of the residential buildings stock, the program "Saving at Home II" is implemented, aiming at promoting interventions to improve energy efficiency in the shell and in the technical systems (heating - cooling - hot water) mainly in residential buildings of low energy rating.

In addition, a series of policy measures have been put in place in order to implement an ambitious plan for both the renovation and the enhancement of the energy efficiency of the stock of public buildings, as well as the full renovation of those buildings that have completed their life cycle.

To that end, the creation of a National Record of all public sector buildings is currently underway.

Furthermore, in order to improve the energy efficiency of public buildings and in the context of the exemplary role of the public sector, it is sought to carry out an annual energy refurbishment of the 3% out of the surface of the central government buildings. This very objective shall be accomplished through the "revised program ELECTRA".

The latter refers to the financing of the investments needed to boost energy efficiency in general government buildings through a blending finance scheme that includes public resources, private funds' participation and the involvement of Energy Service Companies (ESCOs), through Energy Performance Contracts.

The key aim of the program is to create attractive and sustainable energy upgrade investments for the buildings used by public bodies (general government bodies), by effectively leveraging funds from both the private and public sector. The adjustment of the regulatory framework shall facilitate the mobilisation of private funds in a sector with considerable potential, which will contribute significantly towards attaining the ambitious objectives of the national plan for the energy upgrading of buildings.

More specifically, the ELEKTRA program shall strengthen the energy upgrading of public buildings by financing part of the required investments through investment loans, which will be repaid by the programme. It shall also provide for the participation of energy service companies, whereas payments to them, in the context of energy performance contracts, are guaranteed through securities.

Furthermore, at a Regional level, a major intervention consists of the EIB funded Project "Efficient Eco-Friendly Transportation, Public Lighting and Buildings in the Region of Epirus, Greece". The latter is implemented through the ELENA Mechanism of European Investment Bank and aims atimproving the energy efficiency of public buildings and public lighting systems located in the Region of Epirus and deploy sustainable transport. The programme has a substantial scale for the Region as well as a high level of ambition in terms of energy efficiency performance objectives set.

It is the first project of that kind in Greece, while the ELENA assistance contributes substantially to the implementation of the investment program by bringing in missing resources and expertise.

The very investment program consists of four (4) pillars, namely:

- Design and implementation of a sustainable lake transportation system in the city of Ioannina
- Design and construction of a new rural regional road lighting network, including smart grid technology, for the entire Region of Epirus
- Design and deployment of a new LED lighting technology including dedicated control systems in the Municipalities of Arta, Preveza and Igoumenítsa
- Design and implementation of Renewable Energy Systems and Energy Efficiency Retrofits in Public Buildings in the Region of Epirus

- Energy Efficiency annual energy saved 13.6 GWhel and 7.1 GWhth
- Renewable Energy annual total energy generation 1.2 GWh
- $\circ$  CO2 emissions reductions annual total reductions of CO2 emissions 25,400 t CO2 eq.

Furthermore, when it comes to the Regional Unit of Thesprotia, Igoumenitsa consists the only Municipality that has successfully developed a Sustainable Energy and Climate Action Plan (SECAP) within the framework of the Covenant of Mayors Initiative.

Within its SECAP framework, the Municipality of Igoumenitsa has already carried out final studies and subsequently energy saving interventions and inspections, in three public buildings (1st Nursery School of Igoumenitsa, Nursery School of Graikochori, Closed Gym of Igoumenitsa), by taking advantage of the within the framework of the "Exoikonomo" program.

Additionally, Igoumenitsa has already started to implement measures for improving its energy efficiency such as the installation of photovoltaics on the rooftop of a public school and upgrading the energy efficiency of two public school buildings and one public sports complex.

Moreover, the Municipality has carried out an extended improvement of the walking and cycling infrastructure in the city centre, while it is also aiming to the completion of the research for the city lighting, as part of European funding programs.

# 4.2. Cyprus

# **Investments of Energy Efficiency**

In order to achieve the national binding targets of 2020, the MECI started providing various support schemes for investments in energy efficiency and renewable energy to households and the tertiary and industrial sectors over the last years. Since 2003, a Special Fund has been implemented to support RES and Energy Efficiency (EE) investments in Cyprus.

The Fund's revenue comes from the charge per kilowatt-hour for electricity consumption by all end-users. From February 2004, when the Fund's grant programs began, until the end of 2013, a total of  $\in$  100 million was allocated to households, businesses and the public sector to invest in EE and RES measures. It is estimated that  $\in$  67 million from the expenses for the period 2004 - 2013 were granted as a subsidy in the building sector, in investments such as thermal insulation, windows, and the installation of RES systems (MECI, 2017). For 2020 this Special Fund is expected to allocate  $\in$  6 million for the implementation of RES and EE projects in public buildings.

Funding has been strengthened by the addition of resources from the European Structural Funds for the period 2014 - 2020.  $\notin$  48,27 million have been secured for grant schemes and projects for energy efficiency investments in private and public buildings.  $\notin$  8,7 million allocated for improving the energy efficiency for buildings used by SMEs,  $\notin$  18,4 million energy retrofits in households,  $\notin$ 20 million for improving the energy efficiency in central government public buildings and  $\notin$  1,17 million for pilot projects of combined heat and power generation in public and semi-public buildings (MECI, 2017).

The following table gives some examples of investments made for energy upgrades in the buildings of the public and the broader public sector.

**PRO-ENERGY** 

| Description of measures  | Implementation<br>period | Number of investments | Grant/purchase<br>amount |
|--|--------------------------|-----------------------|--------------------------|
| National Green Public Procurement<br>Action Plan - public and broader public<br>sector | 2007-2015                | 67.441                | € 12.392.258             |
| Fluorescent tubes in the public sector   | 2007-2013                | 22.856                | € 29.068                 |
| Installation of air conditioners in the public sector                                  | 2007-2015                | 2.131                 | € 890.472                |
| Replacement of air conditioners in the public sector                                   | 2007-2015                | 1.641                 | € 707.761                |
| Installation / replacement of VRV<br>HEAT PUMP CHILLERS in the public<br>sector        | 2010-2015                | 40                    | € 663.334                |
| Replacement of computers in the public sector  | 2007-2013                | 19.918                | € 8.420.399              |
| Replacement of monitors in the public sector   | 2007-2013                | 20.846                | € 1.596.776              |
| Replacement of boilers in the public sector  | 2010-2013                | 9                     | € 84.178                 |
| Energy savings / RES grant scheme for the public and broader public sector             | 2004-2013                | 3                     | € 37.908                 |
| TOTAL  |                          |                       | € 24.822.154             |

TABLE 18: ENERGY EFFICIENCY INVESTMENTS IMPLEMENTED IN THE PUBLIC SECTOR (MECI, 2017)

# **Mapping of Policies**

#### • Relevant EU Directives

The European Union is committed to developing a sustainable, competitive, secure, and decarbonized energy system by 2050. To meet that goal, Member States and investors need measures that aim to reach the long-term greenhouse gas emission goal and to decarbonize the building stock, which is responsible for approximately 36 % of all CO2 emissions in the Union, by 2050. Member States should seek a cost-efficient equilibrium between decarbonizing energy supplies and reducing final energy consumption.

To that end, the Member States and investors need a clear vision to guide their policies and investment decisions, which includes indicative national milestones and actions for energy efficiency to achieve the short-term (2030), mid-term (2040) and long-term (2050) objectives in conjunction with the 2020 objectives (2018/844/EU) (European Union, 2018).

In addition, the European Commission in December 2019, has adopted the European Green Deal which is a roadmap for making the EU's economy sustainable with actions to boost the efficient

| DE |     | ENI |    | c v |
|----|-----|-----|----|-----|
| PΓ | (U- | EIN | EK | Gĭ  |

use of resources by moving to a clean, circular economy and to restore biodiversity and cut pollution. The green deal will work through a framework of regulation and legislation setting clear targets to achieve a goal of net zero carbon emissions by 2050 at EU level; and a 50-55% cut in emissions by 2030 (compared with 1990 levels).

With those objectives in mind and considering the Union's overall energy efficiency ambitions to boost the energy performance of buildings, the EU has established a legislative framework that includes the Directive 2010/31/EU on the energy performance of buildings and Directive 2012/27/EU on energy efficiency. Both Directives were amended, as part of the Clean Energy for all European package, in 2018 and 2019, respectively.

In particular, the Directive amending the Energy Performance of Buildings Directive (2018/844/EU) introduces new elements and sends a strong political signal on the EU's commitment to modernize the buildings sector in light of technological improvements and increase building renovations (European Commission, 2020).

The Directive amending the energy efficiency (2018/2002/EU) establishes the EU energy efficiency target for 2030 of at least 32.5% (compared to projections), with a clause for a possible upwards revision by 2023. Over the years, the European Commission has published guidance notes to help EU countries to transpose fully the different elements these Directives into national law.

The articles of the aforementioned Directives that directly affect the public sector are described in the following table.

| Directive   | Article  | Description   |
|---|--|---|
| Energy Efficiency<br>Directive<br>(2012/27/EU)                  | Article 5 - Exemplary role of<br>public bodies' buildings  | 3 % of the total floor area of heated and/or<br>cooled buildings owned and occupied by its<br>central government is renovated each<br>year.   |
|   | Article 6 - Purchasing by<br>public bodies                 | Central governments purchase only products, services and buildings with high energy-efficiency performance  |
|   | Article 7 - Energy efficiency<br>obligation schemes        | Each Member State shall set up an energy<br>efficiency obligation scheme and ensure to<br>achieve a cumulative end-use energy<br>savings target. To attain the cumulative<br>target, measures in the public sector could<br>be included.                |
|   | Article 18 - Energy services                               | The Member States shall support the public sector in taking up energy service offers, in particular for building refurbishment  |
| Energy Performance<br>of Buildings<br>Directive<br>(2010/31/EU) | Article 9 - Nearly zero-<br>energy buildings               | The Member States shall ensure that after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings.  |
|   | Article 12 - Issue of energy<br>performance certificates   | An EPC is issued for buildings where a total useful floor area over $500 \text{ m}^2$ is occupied by a public authority and frequently visited by the public. On 9 July 2015, this threshold of $500 \text{ m}^2$ shall be lowered to $250 \text{ m}^2$ |
|   | Article 13 - Display of energy<br>performance certificates | Public authorities that frequently visited<br>by the public, must ensure that the EPC is<br>displayed in a prominent place clearly<br>visible to the public.  |

 TABLE 19: ARTICLES THAT AFFECT THE PUBLIC SECTOR

#### o National Implementation of EU Directive and other relevant National Regulation

As mentioned in chapter 3.2.1, according to Article 5 of Directive 2012/27/EU, Member States should either renovate annually 3% of the total area of buildings owned and used by central government authorities or choose an alternative approach including other cost-effective energy-saving measures in selected privately-owned public buildings (including, but not limited to, deep renovations and measures to change the behavior of users), in order to achieve by 2020 an equivalent amount of energy savings. Since the alternative approach gives more flexibility in implementing cost-effective energy-saving measures as appropriate, Cyprus has chosen this alternative approach. It has been estimated that annual energy savings of 3,316 GWh or 0,285 ktoe have to be achieved for the period 2014-2020 (MECI, 2017).

The same approach will be followed for the period 2021 - 2030, though the annual energy saving obligation that has been recalculated based on the modifications of the public building stock. The new annual energy saving obligation for the period 2021 - 2030 is 1,31 GWh or 0,11 ktoe (NECP, 2020).

Moreover, the relevant provisions of Article 5 of the Directive (2012/27/EU) relating to other public bodies' buildings were transposed into the National Legislation in Article 14 of the End-Use Energy Efficiency and Energy Services (Amending) Law of 2015 (Law 149(I)/2015).

According to article 6 of Directive 2012/27/EU, the central government is obliged to buy and rent only buildings that at least comply with the minimum energy efficiency requirements. In order to comply with this obligation, the Ministry of Finance has recently made a call to buy buildings that will substitute rented buildings currently housing central government authorities. It expected that this measure will change the situation where the central government is a tenant in many buildings of poor energy performance.

Intending to implement Article 6 more effectively, the Treasury of the Republic of Cyprus, following consultation with the MECI, issued and sent a circular ( $\Gamma\Lambda \ AA\Delta\Sigma \ 76$ ) to all contracting authorities falling within the definition of central government authorities, as well as to the contracting authorities in the broader public sector (organizations governed by public law, local authorities, etc.), on 10 August 2016. The circular provided information and explanations on the central government authorities' obligation to apply the provisions of Article 6 concerned in purchasing products, services, and buildings. Guidance was also given on the minimum energy performance requirements to be met in renting buildings (MECI, 2017).

In application of the provisions of Article 7(9) of the Directive (2012/27/EU), as an alternative to the adoption of an energy efficiency obligation scheme, Cyprus has prepared a National Energy Efficiency Programme (NEEP) to achieve the mandatory cumulative energy savings target referred to in Article 7(1). The NEEP was notified to the Commission in December 2013. A revised NEEP was submitted to the Commission in 2014 and 2017. The mandatory cumulative target calculated according to the provisions of this Directive amounts to 241.588 toe and it must be achieved in the 2014-2020 period by taking measures to improve end-use energy efficiency.

Furthermore, mandatory targets were set aiming at the improvement of the energy efficiency of the building stock. According to the article 5A (1) of the National Regulation on the Energy Efficiency of Buildings laws 2016-2017, by 1 January 2019, all new public buildings must be nearly zero-energy buildings. Also, Article 6 (1) (d) of the same Law oblige the issuing of EPC for the buildings in which the total usable area 250 m2 is used by a public authority and is frequently visited by the public.

Finally, with a view to transposing the Energy End-use Efficiency and Energy Services Directive (2006/32/EC), Cyprus adopted the End-Use Energy Efficiency and Energy Services (Energy Auditors) Regulations of 2012 (KDP 184/2012) on 25 May 2012. These Regulations cover, inter alia, matters relating to the setup of a register of energy auditors in Cyprus.

## Interventions and Initiatives

For the improvement of energy efficiency of public buildings many interventions and initiatives implemented over the last years. An overview of these initiatives is given below:

- Since 2013 buildings owned and used by the central government have been energy upgraded, under the "ENERGEIN" project. This project included the major renovation of two buildings and the implementation of individual energy savings and renewable energy measures in another two buildings (Energy Service of the MECI, 2020).
- o By the Decision of the Council of Ministers of 14 April 2016, a Committee was set up for upgrading the energy performance of buildings used by central government authorities, comprising representatives of the Department of Public Works, the Department of Electrical and Mechanical Services, the Directorate of Control of the Ministry of Transport, Communications and Works and the Energy Service of the Ministry of Energy, Commerce and Industry. The relevant working group has been appointed to schedule the energy-saving measures based on the relevant technical data and the funds available. The working group also looks into different financing methods. Financing of €16 million has already been secured from the European and Structural Funds for the period 2014-2020 to implement energy upgrading projects in buildings owned and used by the central public administration (MECI, 2017).
- The Department of Electrical and Mechanical Services has prepared standard energy performance contracting forms for implementing energy savings measures in privately-owned public buildings. These forms can be adjusted in each case and are also expected to trigger the interest of energy service providers (ESCOs).
- The Ministry of Education, Culture, Sports, and Youth has concluded an agreement with the Cyprus Electricity Authority (EAC) for the installation of PV systems with a total install capacity of 4MW combination with the installation of roof thermal insulation in public school buildings. These measures are expected to be implemented in 430 public schools (Energy Service of the MECI, 2020).
- The role of the Energy Saving Officer is also very important. The Energy Saving Officer appointed in each public building has the task of recording energy consumption and promoting energy efficiency mainly through behavioral and information measures. It plays a central role in changing the behavior of civil servants towards the more rational use of energy.
- Significant work has been carried out in recent years by universities and other research institutions in the field of the energy upgrading of existing buildings. The Energy Service of the MECI supports such initiatives, mainly by issuing opinions on the policy implemented by the Republic of Cyprus in the energy sector, as well as on the dissemination of the results. Moreover, the results of these projects are also used as feedback to improve the existing arrangements and incentives relating to the energy upgrading of existing buildings (MECI, 2017).
- Combined heat and power (CHP) units are included in the category of net-billing support scheme, which can be located on any commercial or industrial premises (e.g. commercial or industrial units, public buildings, camps, schools, agricultural and livestock units). The installed power of each CHP system cannot exceed 5MW per installation and the total power for all units allocated to this scheme is 20MW. Unfortunately, until now there is no interest in this scheme as the tariff regime is bit.

# 4.3. Bulgaria

# **Investments of Energy Efficiency**

## SOUTH CENTRAL REGION

Energy Efficiency programmes and submitted reports on their implementation in SEDA South Central Planning Region includes 5 regions - Plovdiv, Pazardzhik, Haskovo, Kardzhali and Smolyan with a total of 58 municipalities.

- Regional programmes under Energy Efficiency Act (ZEE) -
- Municipalities that do not have a ZEE programme
- Municipal programmes under ZEE with expired term
- Municipal programs under ZEE with validity until 2019
- Municipal programs under ZEE with a validity period after 2019.

Reports on the implementation of energy efficiency programmes for 2018 were submitted by 57 municipalities (98.3%) and 5 Regional Administrations (100%). The trend for municipal and regional/district administrations continues implementation of ESM on building stock. Due to opportunities for financing energy efficiency projects, a significant number of projects for improving the energy efficiency of street lighting (SL), ESM measures for building stock, solar collectors for DHWS, etc. are being implemented. The declared results from the implementation of the energy efficiency plans are based on the inspection reports, calculations according to the specialized methodologies or the own assessments of the municipal administrations. Some of the reports presented on the implementation of energy efficiency programs describe attached ESMs, but there is no assessment of their impact.

Implemented ESM in 2019 by districts

#### PLOVDIV REGION

There are 18 municipal administrations in Plovdiv district. In 2019, the ESM on building stock, external MA and use of RES were performed in a total of 9. municipalities.

| Туре  | Num.<br>ESM | Investmet<br>thousand<br>BGN | Saved<br>fuels<br>and<br>energies<br>MWh/<br>year | Savings<br>saved<br>thousand<br>BGN | Saved CO2<br>emissions<br>ton/ eary |
|---|-------------|------------------------------|---|-------------------------------------|-------------------------------------|
| Implemente<br>d ESM in<br>buildings *             | 113         | 3 477,7                      | 1<br>629,19                                       | 41,65                               | 1<br>116,<br>56                     |
| SL systems<br>with<br>completed<br>ESM in<br>2019 | 3           | 2 064                        | 305,12  | 310,2                               | 249,<br>89                          |
| Use of<br>RES                                     | 1           | N<br>/<br>A                  | 14,51   | N/A                                 | 11,8<br>8                           |

TABLE 20: IMPLEMENTATION OF RES ON PLOVID REGION

| Total 117 5 541,7<br>Plovdiv<br>region | 1<br>948,82 | 351,<br>85 | 1<br>378,<br>33 |
|--|-------------|------------|-----------------|
|--|-------------|------------|-----------------|

\*ESM on enclosing elements, heating and ventilation, air conditioning, measuring systems and automation, heating and lighting installations (without gasification and use of RES)

The reporting forms of the municipalities of Brezovo, Kuklen, Maritsa and Parvomay contain only the values for the investments made, which makes it impossible to account for the saved fuels and energies, as well as for the emissions and the redemption period of the measure.

In 2019, a total of 117 were performed in Plovdiv district. ESM in 34 municipal buildings with a total area of 52,870 m2:

- Thermal insulation of external walls 24 pcs. measures in the municipalities of Asenovgrad, Karlovo, Maritsa, Plovdiv, Parvomay, Sadovo and Sopot;
- Thermal insulation of the roof 23 pcs. measures in the municipalities of Asenovgrad, Karlovo, Maritsa, Plovdiv, Brezovo, Sadovo and Sopot;
- Thermal insulation of the floor 8 pcs. measures in the municipalities of Asenovgrad, Karlovo, Sadovo and Sopot;
- Replacement of windows and doors 27 pcs. measures in the municipalities of Asenovgrad, Karlovo, Brezovo, Kuklen, Maritsa, Parvomay, Plovdiv, Sadovo and Sopot;
- ESM of heating and pipe network 20 pcs. measures in the municipalities of Asenovgrad, Kaloyanovo, Karlovo, Parvomay, Sadovo and Sopot;
- ESM under the DHW system 1 pc. in common. Sadovo;
- ESM for lighting systems 11 pcs. measures in the municipalities of Asenovgrad, Plovdiv and Sadovo;
- ESM by MA systems 3 pcs. measures in the municipalities of Karlovo and Kaloyanovo.

In 2019 no inspections of buildings and systems for external SL were performed.

Summarized assessment of the effect of the measures implemented in 2019 to increase energy efficiency in South Central Region

South Central RP covers 5 districts with a total of 58 municipalities. In 2019, the ESM on buildings and external SL were performed in 22 municipal administrations.

| Туре   | Num.<br>ESM | Investmen<br>ts<br>thousand<br>BGN | Saved fuels<br>and energies<br>MWh/y | Savings<br>saved<br>thousand<br>BGN | Saved CO2<br>emissions<br>tons/year |
|--|-------------|------------------------------------|--------------------------------------|-------------------------------------|-------------------------------------|
| Implemented<br>ESM in<br>buildings<br>*        | 244         | 19 433                             | 6 230                                | 288                                 | 2 327                               |
| SL systems<br>with<br>completed<br>ESM in 2019 | 5           | 2 154                              | 305                                  | 324                                 | 250                                 |

| PRO-ENERGY | WP3 | D3.1 |
|------------|-----|------|
|------------|-----|------|

| Use of RES | 5   | 100    | 28    | N/A | 28        |
|------------|-----|--------|-------|-----|-----------|
| Total SCR  | 254 | 21 687 | 6 563 | 612 | 2 60<br>5 |

\*ESM on enclosing elements, heating and ventilation, air conditioning, measuring systems and automation, heating and lighting installations (without gasification and use of RES)

Assessment of the effect of the measures implemented in 2019 to increase energy efficiency in the South-West Republic of Bulgaria in graphs:

| ESM for SL                          |
|-------------------------------------|
| ESM for lighting                    |
| ESM for DHWS                        |
| ESM for heating and ventil.         |
| Replacement of windows and doors 59 |
| Floor isolation                     |
| Roof isolation 49                   |
| External walls isolation 59         |

FIGURE 16: NUMBER OF IMPLEMENTED MEASURES BY TYPES

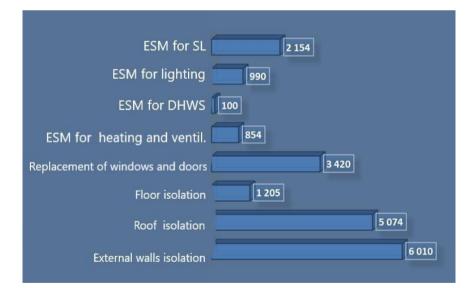


FIGURE 17: INVESTMENTS BY TYPES OF REALIZED ESM, THOUSAND BGN



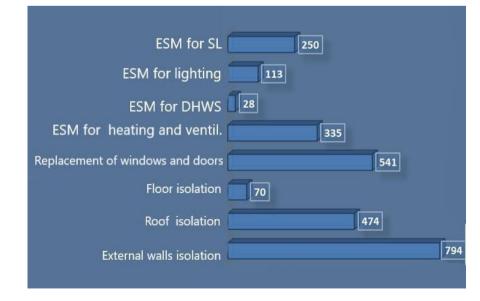
2 003

FIGURE 18: FUEL AND ENERGY SAVED BY TYPES OF MEASURES, MWH / YEAR

External walls isolation

| ESM for SL                       | 324 |
|----------------------------------|-----|
| ESM for lighting                 | 1   |
| ESM heating /ventilation         | 59  |
| Replacement of doors and windows | 76  |
| Floor isolation                  | 11  |
| Roof isolation                   | 68  |
| External walls isolation         | 75  |
|                                  |     |

FIGURE 19: SAVINGS BY TYPES OF MEASURES, THOUSAND BGN / YEAR







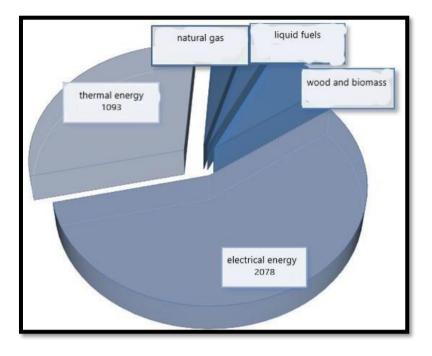
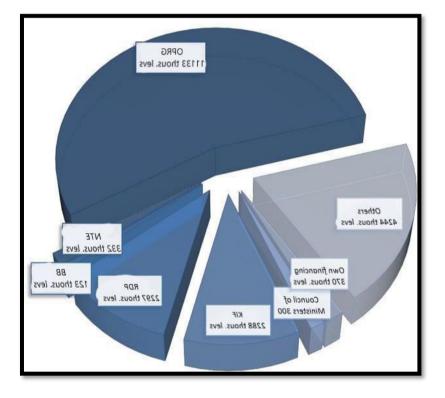


FIGURE 21: TYPES OF SAVED FUELS AND ENERGIES, MWH / YEAR





The trend for municipal and district administrations continues in implementation of ESM on building stock. Due to opportunities for financing energy efficiency projects, a significant number of projects for improving the energy efficiency of street lighting (MA), ESM measures for building stock, solar collectors for DHWS, etc. are being implemented.

The declared results from the implementation of the energy efficiency plans are based on the inspection reports, calculations according to the specialized methodologies or the own assessments

of the municipal administrations. Some of the submitted reports on the implementation of energy efficiency programs describe attached ESMs, but there is no assessment of their effect.

Implemented ESM in 2018 by districts

#### PLOVDIV REGION

There are 18 municipal administrations in Plovdiv region/district. In 2018, the ESM on building stock, external SL and use of RES were performed in 7 municipalities

#### SOUTH CENTRAL REGION

TABLE 22: INVESTMENTS OF SOUTH CETNRAL REGION 2018

| Туре  | Num.<br>ESM | Investments<br>thousand<br>BGN | Saved fuels and<br>energies<br>MWh/year | Savings<br>saved<br>Thousand<br>BGN | Saved CO2<br>emissions<br>tons/year |
|---|-------------|--------------------------------|---|-------------------------------------|-------------------------------------|
| Implemented ESM in<br>buildings *           | 36          | 1 832,89                       | 1 295,69                                | 76,57                               | 496,75                              |
| MA systems with<br>completed ESM in<br>2018 | 2           | 1 973                          | 204,71                                  | 288                                 | 167,66                              |
| Use of RES                                  | 3           | 163,37                         | 174,7                                   | 0                                   | 50,66                               |
| Total Plovdiv region                        | 41          | 3 969,26                       | 1 675,10                                | 364,57                              | 715,07                              |

\* ESM for enclosing elements, heating and ventilation, air conditioning, measuring and automation systems, heating and lighting installations (without gasification and use of RES)

Implementation of 36 ESM in 11 municipal buildings with a total area of 29,606 m2:

- Thermal insulation of external walls 8 pcs. in the municipalities: Asenovgrad, Karlovo, Parvomay, Plovdiv and Rakovski;
- •Thermal insulation of the roof 6 pcs. in the municipalities: Karlovo, Plovdiv and Rakovski;
- Thermal insulation of the floor 4 pcs. in the municipalities: Karlovo and Plovdiv;
- Replacement of windows and doors 8 pcs. in the municipalities: Asenovgrad, Karlovo, Parvomay, Plovdiv and Rakovski;

•ESM of pipe network - 8 pcs. in the municipalities: Karlovo, Plovdiv and Sopot;

 $\odot \text{ESM}$  under the DHW system - 3 pcs. in the municipality of Plovdiv;

OESM for lighting systems - 2 pcs. in the municipalities: Parvomay and Sopot;

•ESM by MA systems - 2 pcs. in the municipalities: Karlovo, Perushtitsa. In 2018 in Plovdiv region there were no inspections of buildings.

#### PLOVDIV REGION

|                                      | 2016 г.      | 2017   | 2018  | 2019    |
|--------------------------------------|--------------|--------|-------|---------|
| Number of ESM                        | 3            | 4      | 4     | 11      |
| Investments thous.<br>lev            | 2<br>57<br>5 | 3 444  | 3 969 | 5542    |
| Saved<br>fuels and energies<br>MWh/y | 1<br>29<br>0 | 3 623  | 1 675 | 1675    |
| Savings saved thous.<br>lev          | 1<br>7       | 3<br>7 | 365   | 35<br>2 |
| Saved CO2<br>emissionston ton/y      | 45<br>6      | 1 256  | 715   | 1378    |

TABLE 23: IMPLEMENTED ESM FOR THE PERIOD 2016-2019 IN PLOVID REGION

The reported results show that in Plovdiv district, after the increase in 2017 there was an increase in the number of ESM and related indicators, except for the savings, in 2018 some of them decreased. In 2019, the number of completed ESMs increased sharply. Investments maintain the upward trend over the years. Fuel savings have increased compared to 2018, but are lower than the values for 2017. Savings in 2018 have increased dramatically compared to the previous two years. In 2019 there is quite slight decline in savings compared to 2018. Savings emissions increased in 2017 compared to 2016, followed by a decline in 2018. In 2019, there is again an increase and the highest values of savings emissions for the period.

TABLE 24: TOTAL FOR SOUTH CENTRAL REGION

|                                | 2016        | 2017        | 2018        | 2019        |
|--------------------------------|-------------|-------------|-------------|-------------|
| Number of ESM                  | 3<br>0<br>9 | 1<br>7<br>9 | 3<br>1<br>9 | 2<br>5<br>4 |
| Investments thousands BGN      | 21 484      | 12 597      | 24 602      | 21 687      |
| Saved fuels and energies MWh/y | 11 591      | 6 486       | 16 535      | 6 563       |
| Savings saved                  | 1 985       | 4<br>8<br>8 | 3 474       | 6<br>1<br>2 |
| Saved CO2 emissionston ton/y   | 4 141       | 2 246       | 5 592       | 2 605       |

The data for the region show that after a significant decline in the implementation of the EJN and related indicators in 2017, in 2018 the indicators have doubled and have the highest values for the period under review. In 2019, compared to 2018, all indicators have decreased their values, but remain higher than those for 2017.

Audit for outdoor artificial lighting sistems in the South Central Region of the period 2016-2019.

|  | Ρ | RO-ENERGY | WP3 |  |
|--|---|-----------|-----|--|
|--|---|-----------|-----|--|

|                                      | 2016 | 2017 | 2018 | 2019 |
|--------------------------------------|------|------|------|------|
| System audits for SL                 | 6    | 3    | 3    | 3    |
| Necessary Investments thousands BGN  | 727  | 34   | N/A  | 2154 |
| Saved fuels<br>and energies<br>MWh/y | 53   | 82   | N/A  | 305  |
| Savings saved<br>Thousands<br>BGN    | 10   | N/A  | N/A  | 324  |
| Saved CO2 emissions ton/y            | 43   | 67   | N/A  | 250  |

The number of audited SL systems remained at the level of 2017 and is twice less than the number of audited SL in 2016. In 2019, the number of ESMs in external SL systems has increased compared to 2017 and 2018. In 2019, the values of investments and savings have increased many times, but the values of fuel savings and emissions savings are more -smaller than those for 2017.

# Mapping of Policies

## • Relevant EU Directives

To achieve the set national energy efficiency target of 27% by 2030, will be implemented existing as well as additional policies and measures:

## • Encouraging public buildings to serve as an example

According to the provisions of Directive 2010/31 / EU on the energy performance of buildings and Directive 2012/27 / EU on energy efficiency, public authorities at national, regional and local level should serve as an example in terms of energy efficiency. In this regard, the Republic of Bulgaria has set a more ambitious goal for the renovation of the buildings owned and used by the central administration as the legal requirement set in Art. 23,ZEE. 1 of the Energy Act, is in all heated and / or cooled buildings - state property, used by the state administration to take annual measures to improve the energy performance of at least 5% of the total area. The reason for imposing a more ambitious goal is not only the need to reduce energy consumption in buildings due to its long-term impact, but also the stimulating role of buildings owned by public authorities, as they represent a significant share of the building stock. and have a high degree of visibility in public life.

## Energy efficient public procurement

According to Art. 30a of the Energy Act, when conducting public procurement, public contracting authorities will purchase only products, services and buildings with high energy efficiency indicators, including:

- $\circ\;$  products meeting the criterion of belonging to the highest possible class of energy efficiency;
- office equipment, defined and meeting the requirements of application"B" of the Agreement between the Government of the United States of America and the European Union on the coordination of energy-efficiency labeling programs for office equipment (OJ L 63/7 of 6 March 2013);

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- car tires that meet the criterion of the highest energy efficiency class for fuel use as defined in Regulation (EC) № 1222/2009 of the European Parliament and of the Council of 25 November 2009 on the labeling of tires according to fuel efficiency and other essential parameters (OJ L 342/46 of 22 December 2009), hereinafter "Regulation (EC) № 1222/2009";
- buildings that meet the minimum requirements for energy characteristics, certified by a certificate for energy characteristics.
- Energy audits and management systems

All are subject to mandatory EE testing:

- enterprises for production, which are not small and medium enterprises in the sense of art. 3 of the Small and Medium Enterprises Act;
- enterprises for provision of services, which are not small and medium enterprises in the sense of art. 3 of the Small and Medium Enterprises Act;
- industrial systems (PS), whose annual energy consumption is over 3000 MWh;
- systems for external artificial lighting, located in a settlement with population over 20,000 inhabitants

The examination is performed at least once every 4 years. Undertakings and owners of power plants that implement an energy or environmental management system subject to certification by an independent body for compliance with European or international standards shall be exempted from the mandatory EE inspection requirements, provided that the system they apply to management includes an energy audit of the relevant plant or industrial system.

The application of an energy or environmental management system and evidence that the management system they apply meets the minimum requirements for energy audits shall be provided to the SEDA within one month of the acquisition of the certificate.

The owners of enterprises, vehicles and systems for outdoor artificial lighting are obliged to perform EE management. EE is managed by maintaining databases on monthly production and consumption by type of energy, annually preparing analyzes of energy consumption, as well as by implementing other measures that lead to energy savings. For the management of EE, the obligated persons shall prepare annual reports according to a template prepared by SEDA, which shall be submitted to the Agency no later than March 1 of the year following the reporting year.

In Bulgaria, a system for audit / inspection for EE and certification of buildings in operation with an area of over 250 m2 has been introduced, in implementation of the provisions of Directive 2010/31 / EU. The certificate for energy performance of a building in operation is updated when performing the following activities leading to a change in the energy performance of the building:

- o reconstruction;
- reconstruction, major renovation or major repairs, when more than 25% of the area of the external enclosing structures and elements of the building are covered. The owners of buildings with an area of more than 250 m2 are obliged to implement the measures for reaching the minimum required class of energy consumption, prescribed by the first inspection, within three years from the date of acceptance of the results of the survey.

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The owners of public service buildings - state and municipal administrations, are obliged to perform EE management. The management is carried out through the implementation of programs, activities and measures to increase EE and annual analysis of energy consumption. For the management of EE, similar to business owners, building owners also prepare annual reports according to a template prepared by SEDA, and the reports are submitted to the Agency no later than 1 of March of the year following the reporting year.

The national legislation also provides for an inspection for EE and optimization of the operation of hot water boilers and air conditioning systems in public buildings. Depending on the installed capacity and the type of energy used, heating installations with hot water boilers are subject to mandatory periodic inspection for EE once on:

- every 6 years for heating installations with natural gas hot water boilers with a single nominal power over 20 kW up to and including 100 kW;
- every 4 years for heating installations with hot water boilers on liquid or solid fuel with single nominal power over 20 kW up to and including 100 kW, and on natural gas with single nominal power over 100 kW;
- $\circ~$  every two years for heating installations with hot water boilers on liquid or solid fuel with a single nominal power over 100 kW.

Air conditioning systems in buildings with a nominal electrical power over 12 kW are subject to mandatory periodic inspection for EE once every 4 years.

A performed inspection for energy efficiency or application of a certified energy or environmental management system is one of the criteria to be met by the enterprises applying for aid under Ordinance № E-PД-04-06 of 28.09 .2016 to reduce the burden related to the cost of energy from renewable sources (Ordinance). These companies should also carry out energy efficiency management and submit a report to the Sustainable Energy Development Agency. The ordinance was issued on the grounds of Art. 4, paragrath 2, item 21 of the Energy Act, in accordance with the Environmental Aid Guidelines. It regulates the terms and conditions for granting aid to undertakings in sectors at risk due to the costs arising from the financing of support for energy from renewable sources in order to maintain the competitiveness of those undertakings.

## o National Implementation of EU Directive and other relevant National Regulation

The Integrated National Plan in the Field of Energy and Climate until 2030 of the Republic of Bulgaria (INPEC) has been prepared in accordance with the requirements of the Energy Union Governance Regulation (REGULATION) (EU) 2018/1999 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December on the governance of the Energy Union and climate action, amending Regulations (EC) N $_{\odot}$  663/2009 and (EC) N $_{\odot}$  715/2009 of the European Parliament and of the Council, Directives 94/22 / EC, 98 / EC 70 / EC, 2009/31 / EC, 2009/73 / EC, 2010/31 / EU, 2012/27 / EU and

2013/30 / EU of the European Parliament and of the Council, Directives 2009/119 / EC and (EU) 2015/652 of the Council and repealing Regulation (EU)  $\ge$  525/2013 of the European Parliament and of the Council), according to which the Member States of the European Union must submit the draft to INPEC by 31.12.2018.

INPEC defines the main goals, stages, means, actions and measures for the development of our national policy in the field of energy and climate, in the context of the European legislation, principles and priorities for the development of energy.

- $\circ$   $\;$  The main objectives set out in this Plan are:
- stimulating low-carbon development of the economy;

- competitive and secure energy;
- o reduction of dependence on imports of fuels and energy;
- guaranteeing energy at affordable prices for all consumers.

National energy priorities can be summarized as follows:

- Increasing energy security through sustainable energy development;
- $\circ$   $\;$  Development of an integrated and competitive energy market;
- Useage and development of renewable energy, according to the available resources, network capacity and national specifics;
- Increasing energy efficiency through the development and application of new technologies to achieve modern and sustainable energy;
- Consumer protection by ensuring fair, transparent and non-discriminatory conditions for the use of energy services.
- The integrated national plan of the Republic of Bulgaria is in compliance with the main strategic documents at European and national level.

The following national strategy documents were used for its preparation (and draft documents in the process of coordination):

- Energy strategy of the Republic of Bulgaria until 2020;
- National strategy for development of the mining industry until 2030;
- Strategy for Bulgaria's participation in the Fourth Industrial Revolution;
- Long-term strategy for rehabilitation of the national building stock from residential and administrative buildings (public and private);
- Innovation strategy for intelligent specialization;
- National program for energy efficiency of multifamily residential buildings;
- National policy framework for the development of the market of alternative fuels in the transport sector and for the deployment of the respective infrastructure;
- National action plan to promote production and accelerated entry of ecological vehicles, including electric mobility in Bulgaria for the period 2012-2014;
- National Action Plan for Renewable Energy;
- National Action Plan for Energy Efficiency 2014 2020;
- National Action Plan for energy from forest biomass 2018-2027;
- National Strategy for Adaptation to Climate Change of the Republic of Bulgaria and Action Plan (draft version);
- Third National Climate Change Action Plan (2013-2020).

## Interventions and Initiatives

Consumer information and training programmes

The measure aims to raise consumer awareness on the electricity, heat and natural gas they use, as well as the benefits of implementing EE measures. Energy retailers publish on their pages information on how to save energy and maintain an online archive of electronic invoices. The companies have EE consultants who help customers reduce their energy consumption without making expensive investments and complex repairs.

Apart from the fact that the measure is applied by the energy traders in the country as part of their information campaigns and initiatives, its implementation is additionally supported by the regional and municipal administrations in the country. Various consumer awareness initiatives are included in the EE programs of regional and local authorities prepared in fulfillment of their obligations under Art. 12 of the ZEE. The initiatives include the creation of consumer councils, the organization of a

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consumer day, as well as numerous campaigns in the district and municipal centers, where customers can learn about ways to save energy.

The information campaigns, as well as the implementation of various behavioral measures are included as eligible measures in Ordinance  $N_{\text{P}}$  E-PA-04-3 of 4 May 2016 on the eligible measures for the implementation of energy savings in final consumption, the ways of proving the achieved energy savings, the requirements for the methodologies for their evaluation and the ways for their confirmation.

To support the implementation of the measure, specialized methodologies for assessment of energy savings are developed after the application of various behavioral measures under Ordinance  $\mathbb{N}$  E-P $\mathcal{A}$ -04-3 of May 4, 2016. The methodologies are prepared according to a model approved in the Ordinance and pass through discussion by specially formed by SEDA expert groups, again by the order of the same Ordinance.

Providing qualification, accreditation and certification schemes

The conditions and the procedure for acquiring and recognizing a qualification for

performing an EE inspection of buildings and industrial systems, and certification of buildings are regulated in the ZEE. The activities for EE inspection, certification of buildings, preparation of conformity assessment of investment projects and preparation of assessments for energy savings are performed by persons entered in public registers maintained by SEDA. The ZEE provides for the requirements to be met by the persons in question, as these requirements are detailed at the by-law level in Ordinance № RD-16-301 of 10 March 2014 on the circumstances subject to entry in the registers of persons conducting inspections and certification of buildings and inspection for energy efficiency of industrial systems, the procedure for obtaining information from the registers, the conditions and the procedure for acquiring qualification and the necessary technical means for carrying out the inspection and certification activities.

The persons entered in the public register of SEDA have a certificate for successfully passed an examination for raising the qualification for carrying out the activities for inspection and certification of buildings and inspection for energy efficiency of industrial systems.

 Mandatory phasing out of solid fuel heating appliances that do not meet the requirements of the Ecodesign Regulations (EU) 2015/1185 and (EU) 2015/1189 and their replacement with other heating means;

The draft National Program for Improving Atmospheric Air Quality 2018-2020 includes a measure in the field of domestic heating - mandatory phasing out in the period 2020-2024 of solid fuel stoves and boilers that do not meet the requirements of the Ecodesign Regulations and the introduction of alternative heating measures to contribute by 78% of the expected reduction of PM10 emissions from the domestic heating sector. The ultimate goal of the measure is the phasing out of inefficient solid fuel appliances.

# **SECTION 5**

# 5. Policy - makers and Public Authorities Planning, Promoting and Implementing Initiatives of Improving Energy Efficiency in partner's countries

# 5.1. Region of Epirus and the Regional Unit of Thesprotia.

The need to renovate the existing building stock is indisputable, as this will result in significant energy and cost savings, while - at the same time - shall improve the comfort, safety and health conditions of the buildings.

To that end, NECP establishes a central quantitative objective for the renovation and replacement of residential buildings with new nearly zero-energy buildings, which could in aggregate amount to 12-15% of all residential buildings by 2030. On a national level, the annual objective is to have an average of 60,000 buildings or building units upgraded in terms of energy and/or replaced with new more energy-efficient ones.

This particular target will contribute significantly to the major upgrading of the ageing building stock and will substantially boost the construction industry through high added value technologies, thus, essentially ensuring increased financial and operating benefits for households in Greece, also enabling them to cover their energy needs.

In essence, the national objective is to improve energy efficiency in final energy consumption by at least 38% in relation to the foreseen evolution of final energy consumption by 2030, as estimated in 2007 in the context of the EU energy policies, thus resulting in final energy consumption levels of not more than 16.5 Mtoe in 2030.

Within this framework, the network of Public Authorities which are in charge of planning, promoting and implementing initiatives that enhance energy efficiency, includes Central Government, meaning the Ministry of Environment and Energy as for the schedule of policy making, while the Regional Authorities and the local municipalities are involved in the implementation part.

As long as the Ministry of Environment and Energy is concerned, its central planning role is expressed - apart from the legislative activity - through the targets, the measures and the initiatives set by the National Energy and Climate Plan. According to the latter, the policy measures for energy efficiency improvement in the period 2021-2030 aim to cover twelve different policy priorities (PP3.1-PP3.12):

- PP3.1: Improvement in energy efficiency of public buildings and exemplary role of public sector - Improvement of urban public space microclimate
- PP3.2: Strategy for renovation of the building stock in the residential and tertiary sector
- PP3.3: Promoting energy efficiency contracts by energy service companies
- PP3.4: Promoting market mechanisms
- PP3.5: Promoting innovative financial instruments to ensure private capital leverage and financial sector involvement
- PP3.6: Improvement in energy efficiency and competitiveness of the industrial sector
- PP3.7: Framework for the replacement of polluting passenger vehicles and goods vehicles
- PP3.8: Developing infrastructure and plans for a shift in transport operations
- PP3.9: Energy efficiency improvement of electricity and gas infrastructures
- $_{\odot}$  PP3.10: Promoting measures for modernising water supply / sewage and

irrigation infrastructures

- PP3.11: Promoting efficient heating and cooling
- PP3.12: Training/informing professionals and consumers on energy-efficient equipment and rational use of energy

The NECP's full set of policy measures envisaged to improve energy efficiency is presented to the following table

TABLE 25: NECP'S SUMMARY OF MEASURES TO IMPROVE ENERGY EFFICIENCY

| Name of policy measure  | Correlation<br>with policy | Sector                                     | Category of                        |
|---|----------------------------|--|------------------------------------|
|   | priorities                 | affected                                   | measure                            |
| Promotion of energy<br>performance contracts (EPCs)<br>through targeted<br>financing programmes.  | PP3.1,<br>PP3.3, PP3.5     | Tertiary<br>sector,<br>public<br>buildings | Economic<br>measure                |
| Financing programmes for the<br>renovation of public buildings<br>in the context of the new<br>programming<br>period.   | PP3.1, PP3.5               | Tertiary<br>sector,<br>public<br>buildings | Economic<br>measure                |
| Financing of public building<br>upgrades on the basis of the<br>Action Plans for Sustainable<br>Energy and the Action Plans<br>for Energy Efficiency of<br>Buildings under the<br>responsibility of municipalities<br>and<br>regions. | PP3.1, PP3.5               | Tertiary<br>sector,<br>public<br>buildings | Economic<br>measure                |
| Improvement of regulatory<br>framework and strengthening<br>of the role of energy managers<br>for<br>public buildings.  | PP3.1                      | Tertiary<br>sector,<br>public<br>buildings | Regulatory<br>measure              |
| Promotion of energy<br>management systems in public<br>buildings.   | PP3.1                      | Tertiary<br>sector,<br>public<br>buildings | Regulatory,<br>economic<br>measure |
| Regulatory measures to<br>promote near-zero energy<br>buildings (nZEBs).  | PP3.1, PP3.2               | Tertiary<br>sector,<br>public<br>buildings | Regulatory<br>measure              |
| Regulatory, tax and<br>financial incentives to<br>promote buildings<br>exceeding minimum energy<br>requirements (nZEBs).  | PP3.1,<br>PP3.2, PP3.5     | Tertiary<br>sector,<br>public<br>buildings | Regulatory,<br>economic<br>measure |
| Financing programmes for the<br>renovation of residential<br>buildings in the context of<br>the new<br>programming period.  | PP3.2, PP3.5               | Residential<br>sector                      | Economic<br>measure                |
| Financing programmes for the renovation of tertiary sector buildings (other than public   | PP3.2, PP3.5               | Tertiary<br>sector -<br>Buildings<br>other | Economic<br>measure                |

| buildings) in the context of the                              |                        | than                 |                     |
|---|------------------------|----------------------|---------------------|
| new   |                        | public               |                     |
| programming period.   | ר כחם                  | buildings<br>Tortion | Francis             |
| Promotion of energy<br>performance contracts (EPCs)           | PP3.2,<br>PP3.3, PP3.5 | Tertiary<br>sector - | Economic<br>measure |
| in the private sector through                                 | гг <b>э</b> .э, ггэ.э  | Buildings            | liledsule           |
| targeted financing  |                        | other than           |                     |
| programmes.   |                        | public               |                     |
|   |                        | buildings            |                     |
| Use of tax and town planning                                  | PP3.2                  | Residential          | Regulatory,         |
| incentives for implementing                                   |                        | sector               | economic            |
| energy savings interventions in                               |                        | Tertiary             | measure             |
| residential buildings and<br>tertiary sector buildings (other |                        | sector,              |                     |
| than public   |                        | Buildings            |                     |
| buildings).   |                        | other than           |                     |
|   |                        | public               |                     |
|   |                        | buildings            |                     |
| Mandatory installation of                                     | PP3.2,                 | Residential          | Regulatory          |
| solar thermal systems in new                                  | PP3.11                 | sector               | measure             |
| buildings and in buildings                                    |                        | Tertiary             |                     |
| undergoing major renovation.                                  |                        | sector,              |                     |
|   |                        | Buildings            |                     |
|   |                        | other than           |                     |
|   |                        | public               |                     |
|   |                        | buildings            |                     |
| Strengthening of the role and                                 | PP3.4                  | All final            | Regulatory          |
| improvement of the regulatory                                 |                        | consumptio           | measure             |
| framework for energy efficiency                               |                        | n sectors            |                     |
| obligation schemes.<br>Implementation of tender               | PP3.4                  | All final            | Economic            |
| procedures for achievement of                                 | FFJ.4                  |                      | measure             |
| energy savings.   |                        | consumptio           | meusule             |
|   | - COO                  | n sectors            | Doculater           |
| Design of framework for setting<br>up innovative technology   | PP3.4                  | All final            | Regulatory          |
| procurement groups.   |                        | consumptio           | measure             |
|   |                        | n sectors            |                     |
| Promotion of energy audits in                                 | PP3.12                 | Industrial,          | Economic            |
| SMEs and in households.                                       |                        | tertiary and         | measure             |
|   |                        | residential          |                     |
| Financing programmer for the                                  |                        | sector               | Economic            |
| Financing programmes for the<br>application of the            | PP3.5, PP3.6           | Industri<br>al and   |                     |
| recommendations of energy                                     |                        | tertiary             | measure             |
| audits  |                        | sector               |                     |
| to obliged or non-obliged                                     |                        | 266101               |                     |
| parties.  |                        |                      |                     |
| Promotion of energy   | PP3.2, PP3.6           | Industri             | Economic            |
| management systems in SMEs.                                   |                        | al and               | measure             |
|   |                        | tertiary             |                     |
|   |                        | sector               |                     |
| Establishment of the National                                 | PP3.5                  | All final            | Regulatory,         |
| Energy Efficiency Fund.                                       |                        | consumptio           | economic            |
|   |                        | n                    | measure             |
|   |                        | sectors              |                     |
| Scheme for the certification of                               | PP3.12                 | All final            | Regulatory          |
| installers of building elements                               |                        | consumptio           | measure             |
| that affect the energy behaviour                              |                        |                      |                     |

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| of<br>buildings.   |                        | n sectors                                |  |
|--|------------------------|--|--|
| Strengthening of the role of<br>energy performance certificates<br>by<br>amending and upgrading them.                                    | PP3.12                 | Tertiary<br>and<br>residential<br>sector | Regulatory<br>measure  |
| Completion of a programme for<br>the installation of individual<br>smart<br>meters.  | PP3.9,<br>PP3.12       | Tertiary<br>and<br>residential<br>sector | Technical<br>measure   |
| Development of the regulatory<br>framework for demand<br>response.   | PP3.9,<br>PP3.12       | All final<br>consumption<br>sectors      | Regulatory<br>measure  |
| Financing programmes for the<br>energy upgrading of street<br>lighting.  | PP3.5                  | Tertiary sector                          | Economic<br>measure  |
| Financial and tax support for<br>investment in energy<br>savings technologies.   | PP3.2,<br>PP3.5, PP3.6 | All final<br>consumption<br>sectors      | Economic<br>measure  |
| Implementation of information actions on energy efficiency.  | PP3.12                 | All final<br>consumption<br>sectors      | Information<br>and awareness-<br>raising<br>measure                              |
| Promotion of energy-efficient<br>products through the<br>implementation of energy<br>labelling and of the eco-design<br>Directive.       | PP3.12                 | All final<br>consumption<br>sectors      | Regulatory<br>measure and<br>information<br>and<br>awareness-<br>raising measure |
| Promotion of green<br>public procurement.  | PP3.1, PP3.7           | Public sector                            | Regulatory<br>,<br>economic<br>measure   |
| Financing programmes for<br>promoting HECHP, district<br>heating/cooling in the context<br>of<br>the new programming period.             | PP3.5,<br>PP3.11       | All final<br>consumption<br>sectors      | Economic<br>measure  |
| Expansion of natural gas<br>distribution networks and<br>deployment of autonomous<br>compressed and liquefied<br>natural<br>gas networks | PP3.9                  | All final<br>consumption<br>sectors      | Technical<br>,<br>economic<br>measure  |
| Promotion of innovative smart<br>city models through the use of<br>state-of- the-art technologies.                                       | PP3.9                  | All final<br>consumption<br>sectors      | Technica<br>l<br>measure   |
| Creation of database for energy<br>characteristics of buildings and<br>energy upgrading actions  | PP3.12                 | All final<br>consumption<br>sectors      | Information<br>and awareness-<br>raising<br>measure                              |

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|---|------------------------|----------------------|---|
| Financing programmes for<br>improvement in the energy<br>efficiency of industries and<br>processors in the context of<br>the new programming period,<br>including the<br>promotion of EPCs. | PP3.3,<br>PP3.5, PP3.6 | Industrial<br>sector | Economic<br>measure                     |
| Promotion of the relocation of industrial plants to industrial-<br>business zones.  | PP3.6                  | Industrial<br>sector | Economic<br>measure                     |
| Promotion of central heat<br>generation and distribution<br>systems<br>at an industrial-business zone<br>level  | PP3.6                  | Industrial<br>sector | Technical<br>,<br>economic<br>measure   |
| Compulsory quotas of vehicles<br>with higher energy efficiency in<br>the fleets of public agencies or<br>organisations.   | PP3.1, PP3.7           | Transport<br>sector  | Regulatory<br>measure                   |
| Promotion of use and<br>improvement of energy<br>efficiency of urban public<br>transport systems.   | PP3.8                  | Transport<br>sector  | Technical<br>,<br>economic<br>measure   |
| Implementation of<br>infrastructure projects which<br>are currently in progress in the<br>(road and railway)<br>transport sector.   | PP3.8                  | Transport<br>sector  | Technica<br>l<br>measure                |
| Elaboration of sustainable urban mobility plans.  | PP3.8                  | Transport<br>sector  | Regulatory<br>measure                   |
| Elaboration of plans and<br>implementation of<br>infrastructures for a shift in<br>commercial transport<br>operations.  | PP3.8                  | Transport<br>sector  | Regulatory<br>measure                   |
| Use of tax incentives to promote<br>alternative fuels in transport<br>(biofuels, hybrid fuels, electric<br>fuels, natural gas, LPG).  | PP3.7, PP3.8           | Transport<br>sector  | Economic<br>measure                     |
| Completion of the institutional<br>support framework for the<br>deployment of infrastructures<br>for promoting alternative fuels<br>in  | PP3.7                  | Transport<br>sector  | Regulatory<br>,<br>technical<br>measure |
| transport (recharging stations<br>for electric vehicles, natural<br>gas, etc.)  |                        |                      |   |
| Implementation of a<br>programme for the<br>replacement of passenger<br>vehicles and light goods<br>vehicles with new high energy<br>efficiency<br>ones.                                    | PP3.7                  | Transport<br>sector  | Economic<br>measure                     |
| Regulatory measures for energy  | PP3.12                 | Transport            | Regulatory                              |

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| savings in the transport sector  |        | sector                                | measure                               |
|--|--------|---------------------------------------|---------------------------------------|
| Promotion of measures for<br>improving energy efficiency in<br>electricity infrastructures.  | PP3.9  | Electricit<br>y<br>infrastruct<br>ure | Regulatory,<br>technical<br>measure   |
| Promotion of measures for<br>improving energy efficiency in<br>natural gas infrastructures.  | PP3.9  | Gas<br>infrastructures                | Regulatory,<br>technical<br>measure   |
| Promotion of measures for<br>modernising water supply /<br>sewage and irrigation<br>infrastructures, to<br>save both water and energy. | PP3.10 | Water<br>infrastruct<br>ures          | Technical<br>,<br>economic<br>measure |

When it comes to the Regional Level, the Region of Epirus has included as a Priority Axis in its Operational Program for the period 2014-2020 the "Environmental Protection and Sustainable Development" and has set a Thematic Objective "To support the shift towards a low carbon economy in all sectors".

The strategy to support the transition to an economy of low CO2 emissions includes:

- investments for the wider use of the energy efficiency contract in public buildings and the residential building sector
- energy efficiency of public buildings, including demonstration projects of buildings with zero 0 emissions and a positive energy balance, as well as radical renovation of existing buildings beyond the optimal level costs
- improving the energy efficiency of transport, especially in urban areas through the promotion of clean technologies, the development of multimodal urban transport systems, etc.
- interventions to improve energy efficiency in urban centers 0

The expected results of the strategy described above include improved energy efficiency and increased energy savings, as well as the reduction of annual CO2 Emissions.

In particular, a specific Investment Priority (4c) has been set for "Supporting energy efficiency, smart energy management and the use of renewable energy sources in public infrastructure, including public buildings, and in the housing sector", as well as additional special targets (e.g. enhancing energy efficiency at the Region's buildings stock) and indicative interventions for their implementation.

Upgrading buildings and improving energy efficiency in public buildings constitutes such an action, while, within this framework priority will be given to buildings with low energy efficiency, in which there is a large potential for energy savings (e.g. hospitals and school buildings), as well as to interventions that will ensure energy efficiency higher than the minimum requirements as defined by the current legislation. In order for the greatest possible leverage of financial resources for interventions in public buildings to be ensured, the possibilities of utilising the PPPs institution will be explored. Moreover, the Operational Program incorporates a series of further measures such as:

- Actions to improve energy efficiency in urban centres, including interventions in the public 0 lighting system of urban centres (e.g. replacement of conventional light bulbs with those of low consumption, adoption of automation for "smart" lighting management, use of photovoltaic collectors in street lighting, etc.) and integrated energy planning in energyintensive urban functions.
- Improving energy efficiency and security of supply through the development of smart energy distribution, storage and transmission systems and through the integration of distributed energy from renewable sources. This priority aims to the reduction of energy production

costs, to increased competition in the supply of electricity, a more efficient management of electrical charge and also contributes to the national target for reducing energy consumption in relation to Strategy Europe 2020.

 Investments to improve the energy efficiency of transport, especially in urban areas. The interventions that will be implemented concern the improvement of the energy efficiency of the medium and heavy vehicles fleet (public sector and the public transport sector) - with a proven significant burden on the urban environment, the expansion of the use of bicycles, and the promotion of sustainable urban mobility.

Within this framework, on September 2020, the Managing Authority of the Epirus Operational Program announced that seven Acts that support the energy efficiency in Epirus Region have been included in the invitation "Interventions that contribute to the energy efficiency of urban transport and centres". Actually, one of those refers to the Municipality of Igoumenitsa and it concerns the replacement of old vehicles with six new energy efficient, low pollution vehicles, with a budget of € 999,998.

In fact, when it comes to Municipal Authorities' level, the Municipality of Igoumenitsa is the only city out of the Regional Unit of Thesprotia that, not only participates in the Covenant of Mayors initiative, but also has proceeded with the accomplishment and submission of its Sustainable Energy and Climate Action plan.

Igoumenitsa's SECAP provides actions and measures to reduce the energy consumption in the following areas:

- $\circ$  Public sector (street lighting, public buildings, public vehicles etc.)
- Primary and Secondary sector
- Household and Tertiary sector
- Road Transport sector.

In the context of energy efficiency sector, the Municipality of Igoumenitsa intends to implement specific actions both in short/mid-term, as well as long term (by 2030), which are presented below:

- Energy Upgrade of Street Lighting
- Energy Upgrade of Public Buildings and Bioclimatic Interventions in the Environment Area of Selected Buildings and Squares
- $\circ~$  Design and Installation of Photovoltaics (RES) in Public Buildings and Lands
- o Installation of Energy Management Equipment for Public Buildings
- Training of employees for the Conclusion of Green Public Procurement/Contracts with Environmental and Energy Criteria
- $\circ\,$  Training of Drivers of the Municipality in ecological driving and more effective Management of the Public Vehicles Fleet
- Replacement of Public Vehicles
- $\circ$  Measures to Improve the Energy Efficiency of Pumping Stations
- $\circ~$  Awareness Campaign for the Benefits of Zero, Low and Average Energy Saving in the Household and Tertiary Sector
- $\circ$  Campaign for Information and Promotion of National Household Sector Programs
- $\circ$  Information for the installation of RES Household and Tertiary Sector.

In addition, one of the main priorities of the Municipality of Igoumenitsa is the implementation of energy saving interventions in public buildings. In particular, the interventions that are proposed as a top priority, concern twenty buildings of the Municipality of Igoumenitsa (15 school buildings and 5 administration buildings), which were proved as the most energy- intensive (increased energy consumption) or the most environmentally harmful (increased CO2 emissions). The building interventions that have been examined are:

- $\circ\;$  Replacement of heating-cooling and AC systems and / or interventions in these installations
- Replacement of frames and glass of external frames
- $\circ$  Interventions in the thermal insulation of a building shell
- o Replacement of luminaires
- Replacement of special lighting (floodlights) in case of sports facilities with modern technology luminaires
- Installation of solar systems Domestic Hot Water (DHW) for the generation of Hot Water in Public Buildings (Indoor Gyms, Nursery Schools)
- o Installation of shades outside the building shell

#### 5.2. Region of Sterea Ellada and Regional Unit of Evia

When it comes to the Regional Level, in the Region of Sterea Ellada, through its Operational Programme for the period 2014-2020, and more specifically, under the Investment Priority 4c "Support for energy efficiency, smart energy management and the use of renewable energy sources in public infrastructure, including public buildings, and in the housing sector", a series of actions are meant to take place in order to improve energy efficiency through:

Public buildings' energy refurbishment actions

Bioclimatic design criteria application and redesign to existing buildings

Shell interventions and functional features redesign of existing public buildings (eg schools, health buildings, social - welfare facilities etc.)

According to the Operational Plan of the Region, the reasons of setting the enhancement of energy efficiency as an investment priority include:

- o The currently low level of RES development in public buildings and facilities
- The low scores of the Region concerning energy efficiency
- The limited access to financial resources for funding such kind of investments
- The fact that enhancing energy efficiency is a high priority in pan-European level
- Its alignment with the PA 2014-2020 targets

 $\circ$  Its contribution in achieving the targets set by the Commission for 2020

Through the implementation of the Operational Programme's relevant thematic target, the Region aims at:

- Reducing conventional energy consumption in order to deteriorate greenhouse gas emissions
- Reducing energy costs and, thus, increasing available income for citizens and SMEs
- Reducing public sector cost, regarding energy consumption related to public buildings and infrastructure. As a result, a reduction of reciprocal fees may become possible.
- Taking advantage of the area's RES potential
- Mobilizing investments in RES sector

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Furthermore, on Municipal Authorities' level, fourteen (14) municipalities of the Region have jointed the Covenant of Mayors; eleven of them have proceeded with the conduction of their Sustainable Energy and Climate Plans.

When it comes to the Regional Unit of Evia, the Municipality of Chalkida has already conducted a Sustainable Energy and Climate Action Plan (the sole municipality out of the three participant cities in the Covenant of Mayors originating from Evia island) in order to promote and implement a series of actions and policy measures for enhancing energy efficiency and reduce energy consumption.

The provisions of the Plan are presented to the following table.

 TABLE 26: POLICY MEASURES REGARDING ENERGY EFFICIENCY - CHALKIDA'S MUNICIPALITY SUSTAINABLE ENERGY AND CLIMATE ACTION

 PLAN -[SECAP-MUNICIPALITY OF CHALKIDA

| Policy<br>Measure /<br>Initiative   | Estimated<br>Energy<br>Savings<br>(MWH/Y) | ESTIMATED<br>EMISSIONS'<br>REDUCTION<br>(TNS CO2/Y) | Budget (€) | Estimated<br>Cost<br>Savings<br>(€/y) | Time<br>schedule |
|---|---|---|------------|---------------------------------------|------------------|
| ESTABLISH<br>MENT OF<br>ENERGY<br>SAVINGS<br>DEPARTME<br>NT               | 5,699.96                                  | 2,435.01  | 540,000    | 680,000                               | 2020-<br>2030    |
| ENERGY<br>AUDITS IN<br>PUBLIC<br>BUILDINGS<br>AND<br>PUMPING<br>STATIONS  | 112.39                                    | 84.76   | 130,000    | 10,000                                | 2019-<br>2021    |
| APPOINTIN<br>G ENERGY<br>MANAGERS<br>IN EVERY<br>MUNICIPAL<br>BUILDING    | 153.26                                    | 112.54  | 360,000    | 15,000                                | 2020-<br>2030    |
| CREATING A<br>DIGITAL<br>RACORD OF<br>MUNICIPAL<br>BUILDINGS              | 38.31                                     | 28.13   | 100,000    | 3,000                                 | 2020-<br>2022    |
| ENERGY<br>REFURBISH<br>MENT OF<br>PUBLIC<br>BUILDINGS                     | 3,220.78                                  | 2,673.07  | 1,300,000  | 360,000                               | 2019-<br>2030    |
| Establish<br>an energy<br>communit<br>y for <b>RES</b><br>developme<br>NT | 1,500.32                                  | 941.66  | 50,000     | 155,000                               | 2021-<br>2030    |

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|--|----------|----------|-----------|---------|----------------|
| BMS<br>INSTALLATI<br>ON IN<br>PUBLIC<br>BUILDINGS  | 202.88   | 161.60   | 240,000   | 19,000  | 2020-<br>2025  |
| Actions<br>TO INFORM<br>USERS OF<br>MUNICIPAL<br>BUILDINGS<br>FOR<br>ENHANCING<br>AWARENESS<br>AND<br>OPTIMISING<br>THE USE OF<br>E/M<br>EQUIPMENT | 169.07   | 134.67   | 100,000   | 16,000  | 2019-<br>2025  |
| PVs<br>INSTALLATI<br>ON ON<br>ROOFTOPS<br>AND ON<br>PARKING<br>STATIONS<br>FOR NET<br>METERING<br>PURPOSES   | 1,518.88 | 1,209.81 | 3,500,000 | 143,000 | 2021-<br>2030  |
| Streetlig<br>hting<br>network<br>upgrade<br>(LED)  | 3,618.32 | 2,882.04 | 1,600,000 | 293,000 | 2019 -<br>2030 |

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# 5.3. Cyprus

The implementation of the energy policy in Cyprus while attaining the climate and environmental targets requires a radical transformation of the energy system over the next decade (2021 - 2030) and, therefore, the implementation of significant investments in energy infrastructure as well as in energy efficiency. Major investments have been planned and scheduled in renewable energy, the transformation of networks and the introduction of smart meters in power distribution, power transmission networks, importing and using natural gas for increasing energy efficiency in power generation, energy efficiency in households, businesses, public sector and water sector, transport infrastructures, and sustainable mobility, as well as in technological research (NECP, 2020).

The national targets for the next decade are specified in detail in the National Climate and Energy Plan (NECP) on a mid-term basis, up to 2030, and should serve as a basis for an ambitious long-term strategy aiming towards the reduction of Greenhouse Gas (GHG) emissions by 2050. Therefore, the decarbonization dimension is the first and foremost component of the NECP structure.

Regarding the public sector, the annual energy saving obligation has been recalculated based on the modifications of the public building stock. The obligation for the period 2021 - 2030 is scheduled to be fulfilled mainly with the following measures (NECP, 2020):

- Deep renovations: Proposal to secure funds from European Cohesion and Development Funds, for the period 2021 2027.
- $\circ~$  Individual target measures: Measures identified as cost optimum as well as measures combined with maintenance works will be undertaken by the
- Department of Public Works and the Department of Electromechanical Services mainly funded by national funds.
- Behavioral measures: The Energy Saving Officer appointed in every public building is entitled to record energy consumption and promote energy efficiency mainly with soft measures. He/she plays a central role in change occupants' habits towards the more rational use of energy.

Table 27, shows the public sector's policies and measures that are planned to be implemented during the period 2021 - 2030, in order to contribute to achieving the energy efficiency target for 2030.

TABLE 27: PLANNED POLICIES AND MEASURES FOR ENERGY EFFICIENCY (NECP, 2020)

| a/a | Policy/Measure  | Sector(s)  |
|-----|---|--|
|     |   | affected   |
| 1)  | Supporting scheme for energy efficiency investment using<br>European Structural and Investment Funds 2021-2027  | Agriculture,<br>Industry, Service,<br>SMEs,<br><b>Public sector</b> ,<br>Households                        |
| 2)  | Implementation of the Energy Fund of Funds which will provide soft loans for energy efficiency  | Agriculture,<br>Industry, SMEs,<br><b>Public sector</b> ,<br>Households                                    |
| 3)  | Supporting Schemes through national Fund of Renewable<br>Energy (RE) & Energy Conservation (EC) for promoting energy<br>efficiency investments in Residential and Public sector and<br>energy audits in SMEs.   | Public sector,<br>Households, SMEs   |
| 4)  | Templates and standard procedures for energy performance<br>procurement in the public sector will be prepared and<br>disseminated to all public authorities.  | Service (Public<br>Sector)   |
| 5)  | Targeted training and other events to be provided to selected target groups, involved in energy efficiency (implementation and financing).  | Agriculture,<br>Industry, <b>Service</b><br>(Public Sector),<br>Transport,<br>Households,<br>Energy supply |
| 6)  | Individual energy efficiency interventions and energy<br>efficiency retrofits in selected governmental and municipal<br>buildings through project funding and Interreg projects<br>CYPRUS-GREECE  | Service (Public<br>Sector)   |
| 7)  | Implementation of individual measures in the building shell, in<br>heating and cooling equipment and energy efficiency retrofits,<br>based on energy performance certificate, aiming at attaining<br>energy savings in existing public buildings (annual obligation<br>under Article 7a and 7b of Directive 2012/27/EU) | Service (Public<br>Sector)   |
| 8)  | Implementation of net-billing scheme to<br>commercial/industrial and public administration consumer<br>categories for the installation of high-efficiency cogeneration<br>HECHP systems with the prime goal of covering their own<br>consumption.   | Industry, Service<br>(Public Sector)   |
| 9)  | Pilot projects (General hospital of Nicosia and the University<br>of Cyprus) for installing high-efficiency cogeneration in public<br>buildings.  | Service (Public<br>Sector)   |

| 10) | Energy efficiency obligation in public purchases and national   | Service (Public   |
|-----|---|---|
|     | green public procurement action plan  | Sector)   |
| 11) | Implementation of soft measures (information campaigns, training, workshops, etc).  | Agriculture,<br>Industry, Service,<br>Households,<br><b>Public sector</b> |
| 12) | Replacing existing lamps/lighting fixtures lighting systems in<br>public roads with new, more efficient ones. The measure<br>concerns the replacement of existing lamps with more efficient<br>ones in the national highway that is under the responsibility of<br>Department of Electromechanical Services, as well as, in local<br>roads that are under the responsibility of the municipalities  | Public Lighting<br>(Local<br>Authorities)                                 |
| 13) | Preparation of standard public tender documents for the selection of Energy Service Providers to conclude Energy Efficiency Contracts from the public and wider public sector. It is expected that the documents will help increase the utilization of Energy Service Providers for the implementation of energy efficiency projects in the public sector.  | Public Sector   |
| 14) | The new minimum energy efficiency requirements will take<br>effect from 1 July 2020. These will require all residential<br>buildings undergoing large-scale renovation to be energy class<br>A, and all other buildings including public buildings to be<br>energy class B +. The EPC is a reliable way to visualize the<br>energy status of an existing building and to record suggestions<br>for its upgrade.   | Non-residential<br>buildings<br>including public<br>buildings             |
| 15) | In the framework of the programming period 2021 - 2027, the MECI, taking into account the importance of energy renovations, has submitted to the competent national authority (DG EPCD) a proposal for the implementation of energy-saving measures in Municipalities and Communities. The proposal has a budget of $\leq$ 15 million, while with the contribution of funds from the Municipalities and Communities the total investment will amount to $\leq$ 30 million. Eligible costs will be renovations of buildings and targeted energy-saving measures. | Local Authorities   |
| 16) | The Ministry of Finance has requested quotes for the purchase<br>of buildings that will replace the leased buildings that house<br>central government authorities. It is expected that this<br>measure will change, at least in part, the current situation<br>where the central government is employed in many low-energy<br>buildings.  | Public Sector   |
| 17) | Ministry of Culture in collaboration with the Cyprus Energy<br>Agency and the Pedagogical Institute (Education Unit for<br>Environment and Sustainable Development), have secured<br>funding of € 500,000 from the European Commission and the<br>Horizon 2020 program for the implementation of technical<br>assistance entitled PEDIA (Promoting Energy efficiency &<br>Developing Innovative Approaches in schools). PEDIA aims to<br>define a long-term strategy for the upgrading of public schools<br>to Nearly Zero Energy Buildings (NZEB).             | Public schools  |
| 18) | As part of the National Operational Programme<br>"Competitiveness and Sustainable Development 2014-2020",<br>the Directorate-General for European Programmes<br>Coordination and Development (DG EPCD), acting as Managing<br>Authority (MA), has dedicated resources to the implementation<br>of an Energy Fund of Funds (EnergyFoF) managed by European<br>Investment Bank. The financial product that will be offered  | Households,<br>SMEs, Public<br>buildings                                  |

| efficiency.   |  |
|---|--|
| The Energy FoF targets in accelerating clean energy investments, including energy efficiency improvements,                  |  |
| renewable energy, and sustainable urban development   |  |
| projects. Investment to improve energy efficiency in public   |  |
| and private buildings, including SMEs.  |  |
| The Energy FoF is co-financed by European Structural and  |  |
| Investment Funds (ESIF) (€ 40 million), national funds as a   |  |
| national loan from EIB ( $\in$ 40 million), and the participated  |  |
| financial intermediaries ( $\notin$ 40 million). Thus, the total  |  |
| allocated an initial amount of EnergyFoF for the period 2020-<br>2023 is €120 million.                                      |  |
| The funding will be allocated to the following  |  |
| Special/Thematic Objectives:  |  |
| Promotion of entrepreneurship in specific population  |  |
| groups enhancing access to finance. (€10.000.000)   |  |
| <ul> <li>Increase energy savings in SMEs. (€14.200.000)</li> </ul>  |  |
| • Increase energy savings in public buildings   |  |
| (€7.900.000)  |  |
| <ul> <li>Increase energy savings in households (€7.900.000)</li> </ul>  |  |
| Upon a successful operation of the fund, it will be used after  |  |
| 2023 in order to continue its operation, utilizing the resources  |  |
| that will be returned to the fund.  |  |
| The establishment of a revolving fund "the Energy Fund of<br>Funds providing soft loans for energy efficiency" is the first |  |
| step towards a more market-oriented financial support   |  |
| scheme. The success or not of this fund is closely associated   |  |
| with the involvement and cooperation with the domestic  |  |
| banking sector.   |  |

#### 5.4. Bulgaria

Directive 2012/27 / EU on energy efficiency (EE) aims to establish a common framework for the promotion of EE in the EU in order to ensure that the 20% energy savings target in PEC is met by 2020, and to create the conditions to improve energy efficiency. The measures are aimed at using the potential for energy savings in the entire range from energy production, transmission and distribution to FEC in buildings and industry; overcoming regulatory and non-regulatory barriers to the market, and raising consumer awareness; setting national targets for energy efficiency by 2020. The main points of Directive 2012/27 / EU have been transposed into national legislation through the adoption of the new Energy Efficiency Act, published in the State Gazette, issue no. 35 of 15.05.2015.

The energy policy of the Republic of Bulgaria is in line with the main objectives of the energy policy of the European Union for energy security, competitiveness and sustainable development. The Energy Strategy of the Republic of Bulgaria until 2020 states that "energy efficiency has the highest priority in the country's energy policy". On this basis, ambitious targets have been set for improving energy efficiency.

#### NATIONAL ENERGY EFFICIENCY GOALS BY 2020

The National Energy Efficiency Action Plan sets the following indicative national targets for energy savings by 2020:

• Energy savings in FEC - 716 Ttoe / year.

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|            |     |      |

Energy savings in PEC - 1590 Ttoe / year, of which 169 Ttoe / year. in the processes of energy conversion, transmission and distribution.

The additional energy savings in QES are determined by the implementation of a strong policy for energy efficiency and optimal absorption of additional financial resources available from various sources in Bulgaria, namely:

- European funds and programs (for the programming period 2014-2020)
- Obligated persons (based on the energy efficiency obligations scheme of energy traders)
- Local sources
- State budget

The implementation of the above-mentioned indicative national targets for energy savings and energy efficiency by 2020 will reduce the PEP in 2020 from 18,460 ha in the reference scenario to 16,870 Ttoe.

The indicative national target for energy efficiency is calculated on the basis of the implementation of the above-mentioned targets for energy savings and is defined as a reduction of the PEI of Bulgaria by 2020 by 41% compared to its level in 2005.

#### ADDITIONAL ENERGY EFFICIENCY OBJECTIVES

In compliance with the requirements of the Energy Efficiency Act (EEA) and in accordance with the provisions of Directive 2006/32 / EC on energy end-use efficiency and energy services, Bulgaria has adopted a national indicative target for energy savings by 2016 in the amount of less than 9% of the average QES for the period 2001-2005, ie for a period of nine years. In this regard, three-year National Action Plans in the field of EE - First (2008-2010) and Second (2011-2013) were developed and introduced, containing specific measures to improve energy efficiency in final energy consumption.

In accordance with the provisions of the Energy Efficiency Act, the national energy savings target was distributed as individual energy savings targets between three groups of obligors:

- Energy traders;
- Owners of public service buildings in operation, with a total built-up area of over 500 m2, and from 9 July 2015 over 250 m2;
- Owners of industrial systems with annual energy consumption over 3000 MWh.

The threshold for the group of energy traders who had individual energy savings targets and could apply measures in all sectors was the equivalent of 75 GWh or more of energy delivered annually to end users.

Directive 2012/27 / EU, adopted in 2012, establishes a new scheme for energy efficiency obligations for energy traders, which differs from the previous national scheme.

With the new Energy Efficiency Act (adopted and published in the State Gazette №35/15.05.2015, the obligated persons are only the final energy suppliers, which carry out:

- sale of electricity to end users more than 20 GWh per year;
- sale of heat to end users more than 20 GWh per year;
- sale of natural gas to end users more than 1 million m3 per year;

- sale of liquid fuels to end users more than 6.5 thousand tons of liquid fuels per year, excluding fuels for transport purposes;
- solid fuel traders who sell to end users more than 13 thousand tons of solid fuels per year.

In order to achieve their individual goals, taxpayers can take energy saving measures in all sectors - industry, transport, households, trade, agriculture, forestry and fisheries, services and more. In 2016, the analysis of the implementation of the national scheme for energy efficiency obligations showed that:

- Fuel and energy traders covered by the national energy efficiency obligation scheme are expected to cover no more than 60% of savings obligations
- In the period 2010-2016, Bulgaria had a national scheme for energy efficiency obligations, covering more debtors owners of public buildings and owners of industrial systems
- In 2015, a National Energy Efficiency Program was adopted for the renovation of multifamily residential buildings

Based on this analysis, the national scheme for energy efficiency obligations was changed through the adoption of amendments to the Energy Efficiency Act of 30 December 2016. According to the changes, Bulgaria introduces alternative measures in addition to the obligations of energy suppliers. The selected alternative measures are:

- Individual energy saving targets for owners of public buildings and owners of industrial systems - 2014-2016
- National energy efficiency program for renovation of multifamily housing buildings current program

| Year                      | Scheme for<br>energy efficiency<br>obligations - a<br>basic approach<br>Ttoe | Alternative<br>measure 1 -<br>Scheme of<br>energy<br>efficiency<br>obligations for<br>buildings and<br>industry Ttoe | Alternativ e<br>measure 2 -<br>National<br>program for<br>renovation of<br>residential<br>buildings Ttoe | Balance for<br>obligated<br>energy<br>suppliers Ttoe |
|---------------------------|--|--|--|--|
| 2014                      | 61,7   | 29   | -  | 32,6   |
| 2015                      | 61,7   | 20   | -  | 30,9   |
| 2016                      | 75,2   | 20   | 7,6  | 47,6   |
| 2017                      | 75,2   | -  | 23,44  | 51,76  |
| 2018                      | 77,1   | -  | 16   | 60,6   |
| 2019                      | 77,1   | -  | 16   | 60,6   |
| 2020                      | 78,3   | -  | 16   | 61,8   |
| ALL<br>2014- 2020         | 506,3  |  |  | 355,86   |
| Accumulation<br>2014-2020 | 1 942,7  |  |  | 1 283,44   |

TABLE 28: BREAKDOWN OF THE LIABILITIES SCHEME 2014-2020 BY YEARS, TTOE / YEAR

#### TRENDS IN ENERGY EFFICIENCY

The main consumers of energy in buildings are households. The technical index only takes into account the increase in energy efficiency of buildings and household appliances, while the gross index shows the real change in household efficiency. The technical index decreased continuously throughout the period and in 2016 was 79% of the level in 2000, the gross index decreased to a lesser extent (to 86.7%) due to the increase in the level of comfort in households.

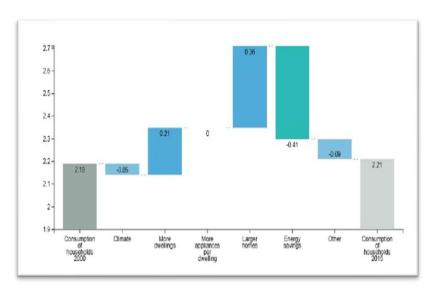


FIGURE 23: BREAKDOWN OF CHANGES IN ENERGY CONSUMPTION OF HOUSEHOLDS 2000-2015 SOURCE: ODYSSEE-MURE PROJECT

Figure 9 shows an analysis of changes in final energy consumption in the period 2000- 2015:

- Final energy consumption is practically constant.
- $\circ$  The increase in the number of dwellings and their average area have contributed to an increase in energy consumption by 0.57 Mtoe.
- Energy savings due to the technical increase of energy efficiency have reduced consumption by 0.41 Mtoe.

The second sector that covers energy consumption in public buildings is the sector "Services".

During the period under review, the ODEX services index showed significant fluctuations - rapid improvements in the period 2002-2004 and after 2012. but also the period of deterioration in the years 2005-2012.

Some reasons for the deterioration of EE in this sector after 2004 are:

- Increasing energy intensity in the period 2007-2011, when the growth in energy consumption is faster than the increase in GVA of the sector.
- The energy consumption per employee (after climate adjustment) increased in the period 2004-2012, regardless of the effects of EE policies and measures, aimed primarily at public buildings.

In 2016, the index reached 87% of the level in 2000, ie, there was an improvement of 13% in the period 2000-2016.

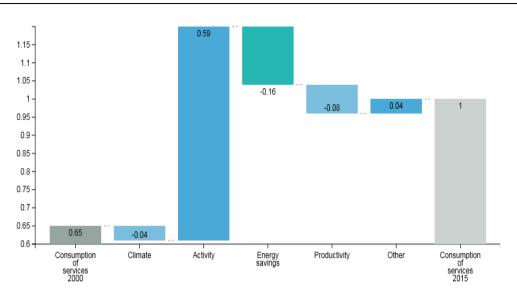


FIGURE 24: BREAKDOWN OF CHANGES IN FINAL ENERGY CONSUMPTION OF THE SERVICES SECTOR 2000- 2015 -[SOURCE: ODYSSEE-MURE PROJECT]

Final energy consumption increased significantly (54%) in the sector for the period 2000 - 2015.

The growth of annual energy consumption is due to:

- $\circ~$  Increased economic activity leads to an increase in consumption by 0.59 Mtoe.
- Energy savings reduce energy consumption by 0.16 Mtoe.
- $\circ~$  The change in the productivity of the sector reduces consumption by 0.08 Mtoe.
- $\circ~$  The climate effect in the period 2000-2015 also contributed 0.04 Mtoe to reduce energy consumption.
- $\circ~$  Other effects, including changes in consumer behavior, lead to an increase in consumption of 0.04 Mtoe.

#### D3.1

# **SECTION 6**

# 6. Analysis of the Regional and National Legal and Regulatory Framework and Relevant Policy- Making Trends

# 6.1. Region of Epirus and the Regional Unit of Thesprotia & Region of Sterea Ellada and Regional Unit of Evia

#### Regulations at Regional and Local Level

In Greece, local authorities do not have a separate legislative framework but comply with central government's legislation. As a result, they are not able to issue separate laws or regulations regarding the energy efficiency of their buildings.

The very fundamentals of Energy Efficiency national regulatory framework consist of:

- Law 4122/2013 "Energy Efficiency in Buildings / Implementation of Directive 31/2010 and other provisions" (GG A' 42/19.02.2013)
- Law 4342/2015 "Pension arrangements, incorporation into Greek Law of Directive 2012/27 / EU of the European Parliament and of the Council of 25 October 2012 "On energy efficiency, amendment of Directives 2009/125 / EC and 2010/30 / EU and repeal of Directives 2004/8 / EC and 2006/32 / EC ", as amended by Council Directive 2013/12
- / EU of 13 May 2013 adapting Directive 2012/27 / EU of the European Parliament and of the Council on energy efficiency , due to the accession of the Republic of Croatia and other provisions." (GG A' 143/9.11.2015), as it stands after the amendments occurred by Law 4713/2020 (GG A' 147/29.07.2020)
- Law 4685/2020 "Modernization of environmental legislation, incorporation into Greek legislation of Directives 2018/844 and 2019/692 of the European Parliament and of the Council and other provisions" (GG A' 92/07.05.2020).
- $_{\odot}~$  Joint Ministerial Decision ( $\Delta E\Pi EA/oi\kappa.1785810$ ) "Approval of the Energy Efficiency
- Regulation of Buildings KENAK" (GG B' 2367/12.07.2017)
- Ministerial Decision (ΔΕΠΕΑ/οικ. 182365) "Approval and implementation of the Technical Instructions of Technical Chamber of Greece for the Energy Efficiency of Buildings" (GG B' 4003/17.11.2017)
- Ministerial Circular for the implementation of Law 4122/2013 "Energy Efficiency in Buildings / Implementation of Directive 31/2010 and other provisions" (ΔΕΠΕΑ/111748/705/19.11.2020, ΑΔΑ ΨΛ424653Π8-P77)
- Ministerial Decision (ΥΠΕΝ/ΔΕΠΕΑ/85251/242) "Approval of a National Plan for increasing the number of n Zero Energy Buildings" (GG B' 5447/05.12.2018)
- Ministerial Decision ((Y.A. ΥΠΕΝ/ΔΕΠΕΑ/6949/72) "Determining how the value of the building or building unit is calculated to characterize a renovation as radical" (GG B' 408/14.02.2019)

The energy efficiency of buildings is calculated based on a methodology defined in the Energy Efficiency Regulation of Buildings (KENAK) which includes, besides the thermal insulation characteristics of the structural elements of the building's shell, a series of additional factors, such as HVAC installations, renewable energy sources, passive heating and cooling elements, shading,

indoor air quality, adequate natural light and building design. The energy efficiency calculation methodology covers the annual energy efficiency of the building and has been prepared in accordance with the relevant European standards.

KENAK defines the minimum requirements for the energy efficiency of buildings and structural elements. These requirements have been set in order to achieve the optimal cost balance between the investments undertaken and the energy costs saved throughout the life cycle of the building.

# Relevant Policy - Making Trends

There are two points worth mentioning concerning energy efficiency policy-making trends on a Regional and municipal level in Greece.

The first refers to the increased appetite of municipalities to participate to the covenant of Mayors initiative.

The Covenant of Mayors was launched in 2008, as an EU-initiative, with the ambition to gather local governments voluntarily committed to achieving and exceeding the EU climate and energy targets. Nowadays, the initiative gathers 9,000+ local and regional authorities across 57 countries drawing on the strengths of a worldwide multi-stakeholder movement and the technical and methodological support offered by dedicated offices.

The Covenant of Mayors for Climate and Energy is open to all local authorities democratically constituted with/by elected representatives, whatever their size and whatever the stage of implementation of their energy and climate policies. As local authorities play a leading role in climate change mitigation and adaptation, participation in the Covenant of Mayors for Climate & Energy supports them in this endeavour, by providing them the recognition, resources and networking opportunities.

Once joining as a signatory, a municipality is committed to develop a Sustainable Energy and Climate Action Plan within two years. Adopted by the local council, a signatory's action plan describes the steps towards its 2020 or 2030 targets. By end-2020, 142 Greek Municipalities that participate in the initiative have conducted and submitted their plans, thus creating the preconditions for taking their energy and climate commitments to the next level.

When it comes to the Region of Epirus, five (5) municipalities have joined the Covenant of Mayors Initiative, while three of them have already conducted a SECAP.

The second point refers to the recently legislated Energy Communities Framework.

The establishment and operation of the Energy Communities as introduced by Law 4513/2018 constitutes a new and integrated institutional intervention, supporting social economy in the energy sector.

Since then, several energy communities have been formed, thus having a significant number of energy projects under development in their portfolios. Due to abundant renewable energy sources from wind and sun, energy communities have the opportunity to transform the energy landscape in Greece.

The energy communities can strengthen the decentralized growth model, since incentives and benefits of clean energy production and management in local scale can be diffused across society to full extent. Locality is strengthened - yet synergies and partnerships with public and private energy stakeholders are promoted.

In addition, such kind of projects shall enact as successful technological examples of self- sufficient and energy autonomous schemes, mostly on a municipal level, while also contributing significantly to the economic and social progress of local communities.

## 6.2. Cyprus

# **Regulations at Regional and Local Level**

In Cyprus, local authorities do not have separate legislation but comply with central government legislation. As a result, they are not able to issue separate laws or regulations regarding the energy efficiency of their buildings.

Additionally, local authorities have also difficulties in implementing, or securing funds for, actions intended for residential and public buildings. This is due to their limited energy-related powers, as such issues are regulated mostly at a central government level.

Another point that is worth noting is that despite the potential, the real market of investment loans is limited to the buildings of local authorities, as the rest of the public building stock belongs to the central government and is thus under the responsibility of the Ministry of Transport, Communication & Works. Thus, any planned renovation or retrofitting should go through the state budget. Therefore, considering that 55 buildings (mainly town halls) belong to municipalities/local authorities with an average floor area of 1.735 m<sup>2</sup> and a cost for EE renovation works at approximately  $\leq 125/m^2$ , the relevant investments needed for EE measures conducted by local authorities amounts to  $\leq 12$  million (Charalambous et al., 2019).

#### Energy Communities

In accordance with Directive 2018/2001/EU on the promotion of the use of energy from renewable sources, Member States shall ensure that final customers have the right to participate in a renewable energy community. In parallel with their participation, they retain the rights or obligations they have as final customers without being subject to conditions or procedures that are not justified or discriminatory and would prevent their participation in a renewable energy community.

The energy community is defined as the legal entity that:

- a. It is based on voluntary and open participation and is under the substantial control of partners or members who are natural persons, local authorities, including municipalities, or small businesses,
- b. Its primary purpose is to provide environmental, economic and social benefits at the community level to its members or partners or the local areas where it operates and not to generate financial gain,
- c. It may be involved in the production, including production from renewable sources, distribution, and supply of electricity, consumption services, cumulative representation, energy storage, energy efficiency services, electric vehicle charging services, or the provision of other energy services like energy renovations (2019/944/EU).

## **Relevant Policy - Making Trends**

Local authorities in Cyprus have taken the lead by stressing the role of local authorities in new technological challenges and environmental issues, such as addressing climate change and adapting to its impact. With support from the Cyprus Energy Agency, local authorities have endorsed the Covenant of Mayors or the Covenant of Islands, or have been accredited by the 'European Energy Prize'. The key obligations under these initiatives include the development of local Sustainable Energy Action Plans (SEAPs), intending to reduce carbon dioxide emissions by more than 20% by 2020. The action plans include, among other things, actions for improving the energy efficiency of buildings used by local authorities as well as actions for promoting measures relating to the energy upgrading

of existing buildings or the construction of new ones with a high energy efficiency rating in the residential and tertiary sectors, to contribute towards energy savings.

A total of 23 sustainable energy action plans are estimated to ensure a reduction of approximately 600.000 tons of carbon dioxide (35 % lower emissions compared to 2009, i.e. the reference year), an increase in the amount of RES energy to 90.000 MWh/year, as well as energy savings of more than 2.000.000 MWh/year by 2020 (MECI, 2017).

Several local authorities have expressed an interest in extending their action up until 2030, with more ambitious targets for reducing carbon dioxide emissions by more than 40 %. They are also ready to make a commitment to studying their vulnerability to the impact of climate change and implement measures for adapting to it. They are also joining forces with other insular local authorities in Europe, in support of the 'Smart Islands' initiative, which aims to stress the specificities of insular areas and mobilize targeted financing for RES, energy efficiency and sustainable transport projects on the islands.

Following the above measures, in 2019 the Commissioner for Mountain Areas prepared the National Strategy for the Development of the Troodos Mountain Communities, which includes a description of the current energy situation of the specific area and measures to improve it (Energy Service of the MECI, 2020).

Finally, at the level of local government, the Municipalities of Nicosia, Paphos, and Aradippou have developed initiatives for their transformation into smart cities. Many of the actions they plan are not purely in the energy sector but provide for the development of applications and infrastructure through a package of advanced digital services that can be used in the future by energy communities as well (Energy Service of the MECI, 2020).

## 6.3. Bulgaria

## **Regulations at Regional and Local Level**

## **Relevant Policy - Making Trends**

The current active measures are 11 - mainly legislative, fiscal and financial. Among the measures are ZEE, the Scheme for obligations for energy savings and individual targets for energy savings, FEEVI, preferential prices for electricity from cogeneration and renewable sources, and others. The measure with the most significant horizontal impact is the scheme of commitments with individual targets for energy savings for energy traders. During the first scheme (until 2014), a total of 52 companies that annually supply fuels and energy with an equivalent in excess of 75 GWh received individual targets. For the period from the start of operation of the scheme 2008-2014 inclusive, the achievement of 48.2% of the target was achieved.

For the period 2014-2020, a new scheme with obligations for energy suppliers was put into operation - including alternative measures, in accordance with Article 7 of Directive 2012/27 / EC on energy efficiency. This new liability scheme was drawn up in accordance with Annex V, Part 4 of the Directive.

Following an analysis of the implementation of the national liability scheme, it was amended through changes in the ZEE introduced on 30 December 2016. According to the changes, Bulgaria introduces alternative measures as an additional approach to the obligations of energy traders. The total volume of annual energy savings under the new scheme amounts to 506.3 have (5887.3 GWh) by 2020, with the share of energy traders amounting to 70% or 355.9 thousand tons (4138 GWh). The calculations under the new liability scheme are shown in Figure 25. "Breakdown of liabilities by years (2014-2020)" of this national report.

#### Models and dynamics of horizontal measures:

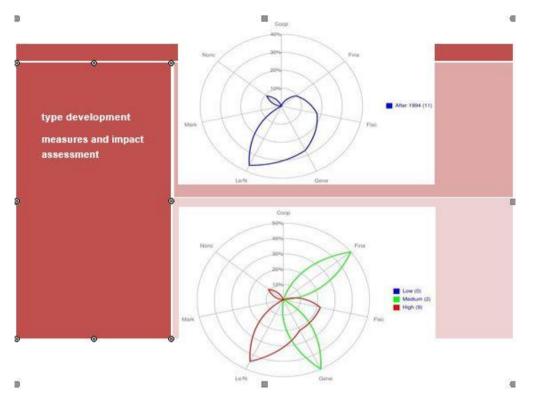


FIGURE 25: DEVELOPMENT OF HORIZONTAL MEASURES IN THE PERIOD 1995-2017 BY TYPE AND IMPACT ASSESSMENT

Prior to the adoption of the Energy Efficiency Law, the focus of horizontal measures was on national and sectoral energy efficiency improvement programs. After the adoption of the law, the focus shifted to the implementation of regulatory measures. One of the completed horizontal measures in the country with thegreatest impact was the distribution as individual targets among energy traders, part of the national target for energy savings set by Directive 2006/32 / EC. The measure functioned as horizontal due to the fact that in their efforts to achieve individual goals, energy traders could implement energy efficiency measures in all sectors of the economy.

The latest ongoing high-impact horizontal measure is the introduction of a liability scheme for energy traders who need to achieve savings in the period 2014- 2020 according to the requirements of art. 7 of Directive 2012/27 / EC.

Examples of measures with significant quantitative impact Quantification of some of the more important horizontal measures:

| Horizontal measu   | res                              |
|--|----------------------------------|
| Measure  | Количествена оценка на годишните |
| EN 15: Energy Efficiency and Renewable Energy Fund (EEREF)                     | 141,7 GWh (achieved to 2017)     |
| EN 17: Individual targets for energy traders obliged under the ZEE (2008-2016) | 2301 GWh (achieved to 2016)      |
| BG 25: Energy saving obligations scheme<br>2014 - 2020                         | 5889 GWh (goal to 2020)          |

# **SECTION 7**

# 7. Analysis of Relevant Strategies and their Objectives7.1. Region of Epirus and the Regional Unit of Thesprotia & Region

## of Sterea Ellada and Regional Unit of Evia

The energy savings objective under Directive (EU) 2018/2002 on energy efficiency in the period 2021-2030 amounts to 7,299 ktoe of cumulative energy savings, taking into account the obligation to achieve energy savings annually equal to 0.8% of the average final energy consumption of the 2016-2018 period.

| Year | Energy Savings on an annual<br>basis (ktoe) |       |       |       |       |       | Cumulative<br>Savings |       |       |       |       |
|------|---|-------|-------|-------|-------|-------|-----------------------|-------|-------|-------|-------|
| 2021 | 132,7                                       |       |       |       |       |       |                       |       |       |       | 133   |
| 2022 | 132,7                                       | 132,7 |       |       |       |       |                       |       |       |       | 265   |
| 2023 | 132,7                                       | 132,7 | 132,7 |       |       |       |                       |       |       |       | 398   |
| 2024 | 132,7                                       | 132,7 | 132,7 | 132,7 |       |       |                       |       |       |       | 531   |
| 2025 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 |       |                       |       |       |       | 664   |
| 2026 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 | 132,7 |                       |       |       |       | 796   |
| 2027 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 | 132,7 | 132,7                 |       |       |       | 929   |
| 2028 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 | 132,7 | 132,7                 | 132,7 |       |       | 1.062 |
| 2029 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 | 132,7 | 132,7                 | 132,7 | 132,7 |       | 1.194 |
| 2030 | 132,7                                       | 132,7 | 132,7 | 132,7 | 132,7 | 132,7 | 132,7                 | 132,7 | 132,7 | 132,7 | 1.327 |
|      | Total                                       |       |       |       |       |       |                       | 7.299 |       |       |       |

TABLE 29: SETTING THE ENERGY SAVINGS OBJECTIVE UNDER ARTICLE 7 OF DIRECTIVE (EU) 2018/2002 -[ SOURCE: NECP]

This energy savings objective will be attained by combining energy efficiency obligation schemes with a mix of alternative policy measures.

More specifically, energy efficiency obligation schemes will account for 20% of the total cumulative objective for the period 2021-2030, whereas a total of additional nine alternative policy measures will be implemented to cover the remaining part of the objective, reflecting the key policy priorities and the most important energy efficiency improvement measures.

TABLE 30: MIX OF POLICY MEASURES TO ATTAIN THE OBJECTIVE UNDER ARTICLE 7 OF DIRECTIVE (EU) 2018/2002 - [SOURCE: NECP]

| Policy measure   | Total cumulative EU<br>(Ktoe) |
|--|-------------------------------|
| Energy upgrading of residential buildings                            | 2.878                         |
| Energy upgrading of public buildings                                 | 208                           |
| Energy upgrading of tertiary sector buildings and industrial plants  | 427                           |
| Improvement in energy efficiency through energy service<br>companies | 196                           |
| Energy managers in public buildings                                  | 1.042                         |
| Energy upgrading of pumping equipment                                | 315                           |
| Energy upgrading of street lighting                                  | 180                           |
| Development of transport infrastructures                             | 264                           |
| Promotion of alternative fuels in road transport                     | 329                           |
| Energy efficiency obligation schemes                                 | 1.460                         |

## 7.2 Cyprus

In the previous chapters, an analysis of the policies and measures as well as the EU and Cyprus regulatory framework for improving the energy efficiency of public buildings was carried out. In this Chapter, the relevant strategies that do not directly target energy efficiency but their proposals/actions indirectly affect the energy efficiency of public buildings will be described in the following table.

#### TABLE 31: : RELEVANT STRATEGIES AND THEIR OBJECTIVES

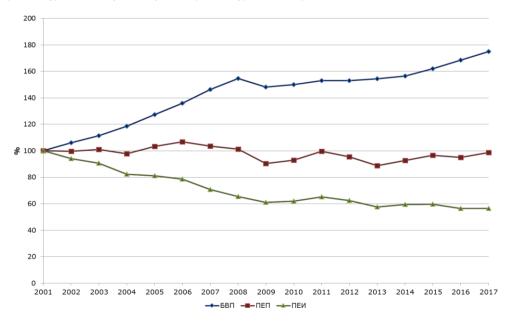
| a/a | Strategies  | Objectives  |
|-----|---|---|
| 1)  | Supporting Scheme for the<br>Introduction of an Environmental<br>Management System (EMAS) | The scheme aimed to increase the environmental efficiency of organizations through the establishment of an EMAS in accordance with the provisions of Regulation 1221/2009 / EC, and concerns the provision of government financial support to companies and organizations of the public and private sector (EMAS, EU/1221/2009). EMAS aims to address the environmental aspects of companies / organizations, reduce the use of natural resources and continuously improvement of their environmental performance. Also, through the compliance with the provisions of EMAS, the improvement of energy efficiency of the buildings is achieved. |
| 2)  | CY Green Public Procurements<br>(GPP) AWARDS  | The CY GPP awards are awards given to public<br>and private bodies that actively contribute to<br>the dissemination of green procurement and<br>aim to reduce the impact of their activities on<br>the environment and on healths. The awards<br>are designed to provide an annual recognition<br>of the efforts and environmentally friendly<br>action of public bodies and bodies governed by<br>public law implemented by 2014. One of the<br>categories that are included in the awards is<br><i>Building Constructions - Energy Efficiency of<br/>Buildings</i> .  |
| 3)  | Certification of Municipalities with<br>ISO 50001   | The EU Horizon 2020 funded project<br>COMPETE4SECAP (C4S) aims to deliver a<br>systematic approach to energy savings in local<br>authorities using energy management systems<br>(EnMS) according to ISO 50001. The<br>municipalities that participate in the project are<br>Lakatamia, Agios Athanasios, Aradippou and<br>Strovolos (C4S guidebook<br>https://compete4secap.eu/fileadmin/user_upl<br>oad/EnMS/EnMS_manual_for_LAs_2019_Part_1.<br>pdf )   |
| 4)  | Green TAX   | The green tax reform will include the pricing of coal in sectors outside the Emission Trading System of the Cypriot economy. Such a reform could indeed further stimulate investment in energy efficiency and RES measures especially in the field of buildings. In 2019, the Minister of Finance announced that a green tax reform will be consulted in 2020 with the aim of adopting the relevant legal framework and implementing such a reform in 2021 (Energy Service of the MECI, 2020).  |

| PRO-E | NERGY   | WP3   | D3.1                                      |
|-------|---|---|---|
| 5)    | Promotion of smart technologies -<br>Indicator of intelligent readiness<br>of buildings | The promotion of smart technologies is a key<br>pillar for the digitization of the energy sector<br>The data collection through digitization of the<br>building sector is expected to help implement<br>more targeted energy saving and RES measured<br>during renovation. One of these smart<br>technologies is the indicator of intelligent<br>readiness of buildings. This indicator will be<br>used to measure the ability of buildings to use<br>information and communication technologies<br>and electronic systems to adapt the operation of<br>buildings to the needs of tenants and the grid<br>and to improve energy efficiency (Energy<br>Service of the MECI, 2020). | t<br>s<br>t<br>t<br>e<br>e<br>s<br>f<br>f |

#### 7.3 Bulgaria

#### ANALYSIS OF THE TENDENCIES OF ENERGY CONSUMPTION IN THE REPUBLIC OF BULGARIA

Data from Eurostat and the NSI were used in preparing the analysis. In 2018, the methodology used by the NSI for the preparation of energy balances was changed and is fully consistent with the main recommendations of IRES (International Recommendation on Energy Statistics). In this regard, the data from this analysis are not comparable with the Annual Reports on the implementation of the NEEAP in previous years.



Primary energy consumption, primary energy intensity

FIGURE 26: GROSS DOMESTIC PRODUCT, PRIMARY ENERGY CONSUMPTION AND PRIMARY ENERGY INTENSITY IN THE PERIOD 2001-2017, INDICES 2001 = 100%.- [SOURCE: ACCORDING TO NSI DATA]

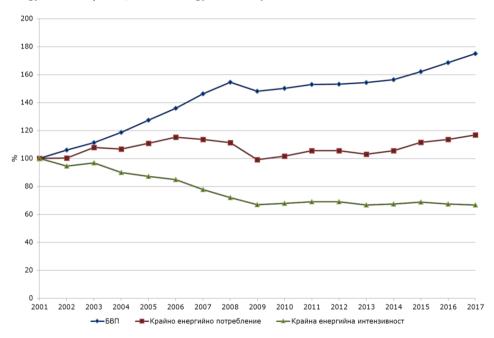
In figure 26 shows the indices of change of Gross Domestic Product (GDP), PEP and Primary Energy Intensity (PEI) in the period 2001-2017 and the index in 2001 was adopted as 100%. The long-term trend in the period 2001-2017 is a total GDP growth of nearly 75%, while primary energy consumption (PEP) decreased by 1.5%.

| PRO-ENERGY     | WP3   | D3 1 |
|----------------|-------|------|
| FIND-LINEINO I | VVE J | D3.1 |

As a result of the significant GDP growth and the practically unchanged value of PEP, the primary energy intensity (PEI) also significantly decreases. In 2017, it decreased up to 56% of the level in 2001. In 2017, GDP increased by 3.8% compared to the previous 2016, but PEP also increased by 3.7%. PEI in 2017 remains virtually unchanged at 0.211 kgoe / BGN.2010 as it was in the previous 2016. After the significant reduction of energy intensity in 2016, this favorable trend does not continue in 2017. The main factors that determine the change of PEP and PEI are:

- The ratio between PEP and FEC, which shows the efficiency of energy conversion, transmission and distribution from the energy sector to end users.
- FEC, which depends on the energy efficiency of the final users.

As a result of the impact of the above factors, the ratio between FEC and PEP decreased from 53.8% in 2016 to 53.1% in 2017 or an increase of 650 ktoe in PEP. The deteriorated efficiency in the energy sector in 2017 is due to a reduction in the use of energy from renewable sources and increased losses in the conversion, transmission and distribution of energy.



#### Final energy consumption, final energy intensity

FIGURE 27: GROSS DOMESTIC PRODUCT, FINAL ENERGY CONSUMPTION AND FINAL ENERGY INTENSITY IN THE PERIOD 2001-2017, INDICES 2001 = 100%. [SOURCE: ACCORDING TO NSI DATA]

In 2017, FEC increased by 2.3%, which with a GDP growth of 3.8% leads to a slight decrease in CEI by 1.4% compared to 2016 - from 0.113 kgoe / BGN.2010 to 0.122 kgoe /lv.2010.

From the analysis of the factors influencing the change in KEI the following conclusion can be made - the shares of the Industry and Services sector in the gross value added (GVA) in 2017 remain practically at the level of the previous 2016, which means that during the year there are no structural changes in the economy, due to which the decrease in KEI in 2017 is entirely due to changes in energy intensity within individual economic sectors.

The change of FEC in the main sectors that consume energy in the period 2001-2017 is shown in the following fig.

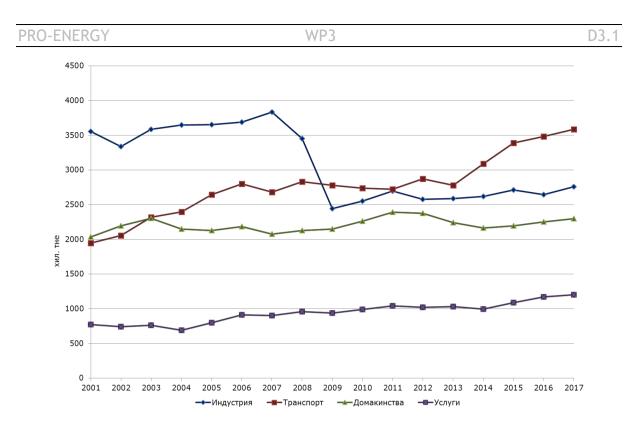


FIGURE 28: FINAL ENERGY CONSUMPTION BY SECTORS 2001-2017 SOURCE: ACCORDING TO NSI DATA

During the period 2001-2017, energy consumption decreased significantly in the sector Industry (by 24.2%). The decrease in consumption in the agriculture sector is 37%, but as the sector has the smallest share in FEC it is not shown in the figure. The growth of household consumption is relatively moderate - 17.4%. Significant growth (55%) is in energy consumption in the Services sector. The largest growth in 2017 compared to 2001 was recorded in the Transport sector - 67.4%, which since 2009 has replaced the Industry sector as the largest energy consumer.

The analysis for the last statistical year - 2017 shows an increase compared to 2016 in energy consumption in the industry sector by 3%, in the transport sector by 1.8%, in the services sector by 2.4%. % and in the Households sector - by 3%. In the "Agriculture" sector there is a decline in consumption, as in 2017 it was 6.4% compared to 2016.

SOURCES OF FINANCING of projects for improvement of energy efficiency and of projects using energy from renewable sources in Bulgaria

- Physical persons
- Companies
- Minicipalities (Public sector)
- Operatrional Programme regions in Groth 2014-2020 г.
- Energy Efficiency of Multi-Family Residential Buildings National Programme
- Energy Efficience and Renewable Sources
- The program for lending to energy efficiency in the home
- Financial mechanism of the European Economic Area 2014-2021
- Rural Development Program 2014-2020

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