

PRO-ENERGY

**“Promoting Energy Efficiency in Public Buildings
of the Balkan-Mediterranean Territory”**

WP3: Joint Regional Analysis, Strategy and Framework

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1. Region of Sterea Ellada: General Information

1.1 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 1: 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 2018, accounting for 4.7% of the Greek economic output. GDP per capita adjusted for purchasing power was 18,900 € 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.

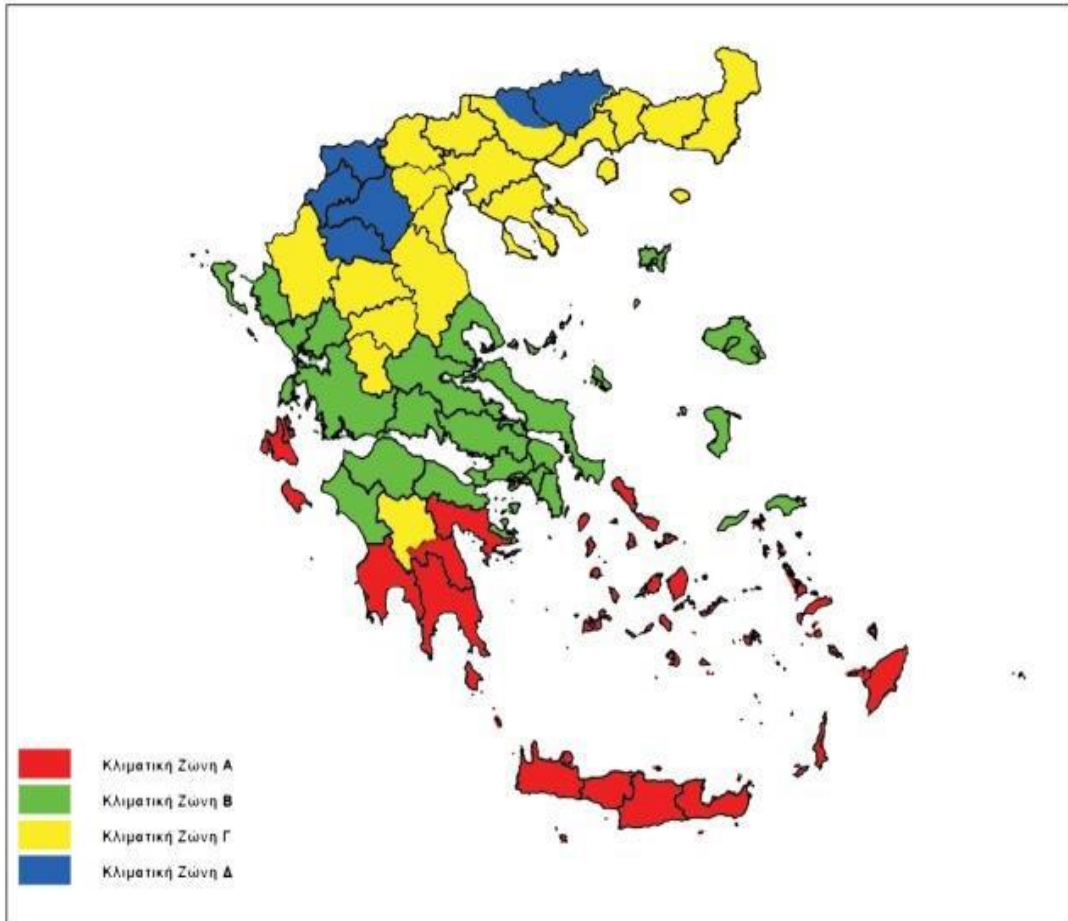
The Regional Unit of Evia includes the islands of Evia and Skyros, as well as a small part of Sterea Ellada. Evia is the second largest island of the Greek archipelago after Crete. It is separated from the main country by the Evian Sea which consists of two large bays. The Regional Unit covers a total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

1.2 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.

Figure 2: Climate Zones in Greece



Source: KENAK

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.

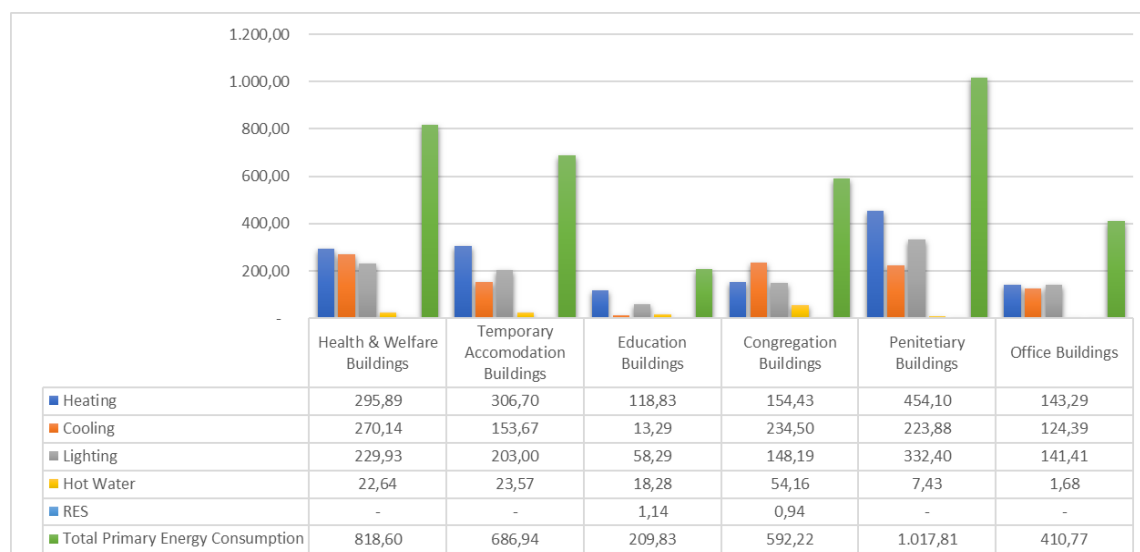
On the other hand, and as long as the coastal areas are concerned, the climate is characterized as Mediterranean, with an average annual temperature of 18 °C.

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.

1.3 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.

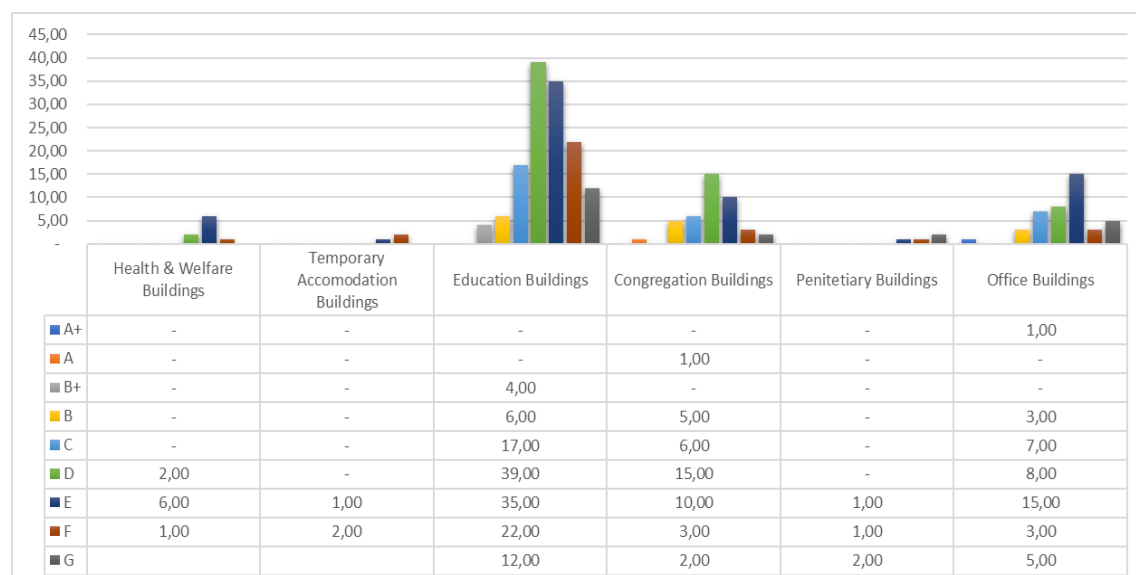
Figure 3: Average Primary Energy Consumption per purpose - Public Buildings/Region of Sterea Ellada (kWh/m²)



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 4.

Figure 4: Energy Performance Certificates per Use and Class - Public Buildings/Region of Sterea Ellada (kWh/m²)



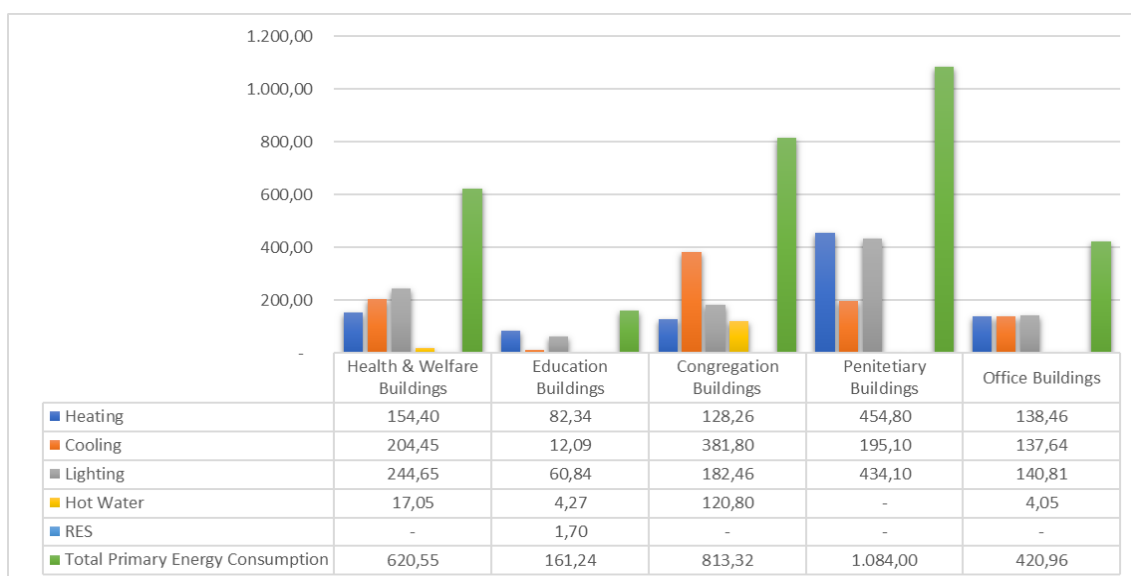
Source: Ministry of Environment & Energy

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/m²) in public buildings is presented to Figure 5.

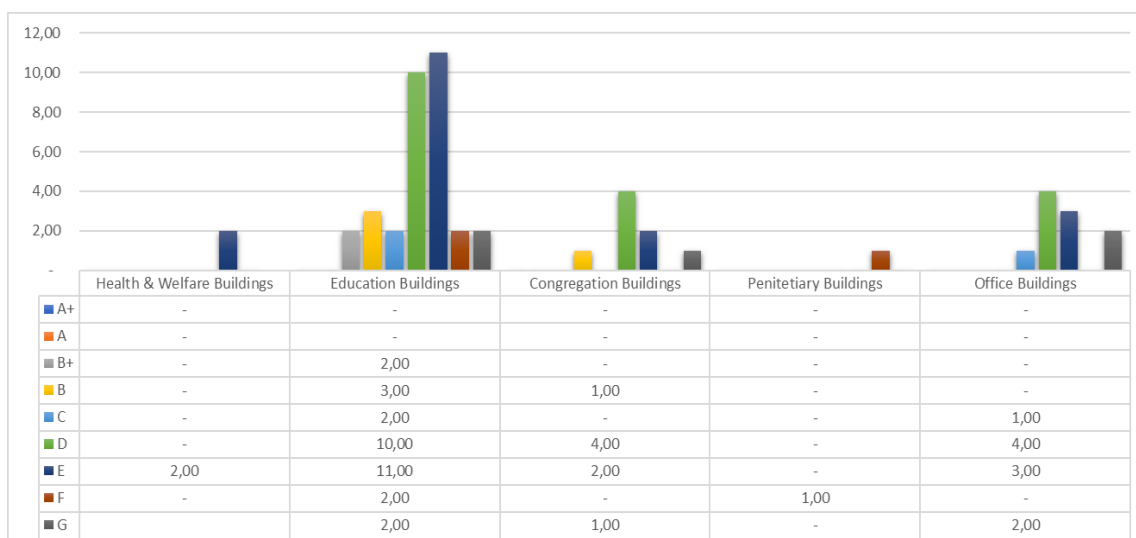
Figure 5: Average Primary Energy Consumption per purpose - Public Buildings/Regional Unit of Evia (kWh/m²)



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 6.

Figure 6: Energy Performance Certificates per Use and Class - Public Buildings/Regional Unit of Evia (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 (36 buildings) belongs to Class D and E, while no buildings have achieved an A/A+ Grade.

1.4 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 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 1: RES Installed Capacity – Region of Sterea Ellada

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

Source: DAPEEP/RES info note Sep-20

1.5 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/m²) 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 m² 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 m². 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/m²), indoor gyms (1,107 kWh/m²) and institutions (1,002 kWh/m²) 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/m²) and lighting (113 kWh/m²) purposes. In addition, 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).

2. Stakeholders in the Region of Sterea Ellada and in the Regional Unit of Evia Relevant to Energy Efficiency of Public Buildings

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 7: 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 Sterea Ellada and the Regional Unit of Evia are presented to the following table.

Table 2: Stakeholders’ Matrix

Stakeholder Category & Key Features	Interests and how they are affected by the project	Opportunities & Incentives for Change	Possible Actions
Central Government Bodies <ul style="list-style-type: none"> Ministry of Environment and Energy Ministry of Transport and Infrastructures Ministry of Finance Ministry of the Interior 	<ul style="list-style-type: none"> Develop energy policies and interventions Manage / implement / coordinate Sectoral and Regional Operational Programmes of the NSRF that include 	<ul style="list-style-type: none"> Political influence Decision-making power Financial resources 	<ul style="list-style-type: none"> Increasing their information through conferences, public consultations, bilateral meetings, etc. Mobilizing representatives/ associations of citizens and

<ul style="list-style-type: none"> • Ministry of Development and Investments • Ministry of Education and Religious Affairs • Ministry of Health 	<p>actions related to energy</p>		<p>corporations to influence them</p>
<p>Regional and Municipal Authorities</p> <ul style="list-style-type: none"> • Region of Sterea Ellada • Decentralized Administration of Thessaly and Sterea Ellada • Regional Unit of Evia • Municipalities of Evia Regional Unit • Municipalities belonging to other Regional Units of Sterea Ellada 	<ul style="list-style-type: none"> • Develop energy policies and interventions • Own and manage public sector buildings • Manage / implement / coordinate Regional Operational Programmes of the NSRF that include actions related to energy 	<ul style="list-style-type: none"> • Political influence • Decision-making power • Financial resources 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc. • Mobilizing representatives/ associations of citizens and corporations to influence them
<p>Public Companies</p> <ul style="list-style-type: none"> • Hellenic Public Properties Company (HPPC) S.A. • Building Infrastructures (KTYP) S.A. • Development Agency of Evia S.A. 	<ul style="list-style-type: none"> • Own and manage public sector buildings 	<ul style="list-style-type: none"> • Decision-making power 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc. • Mobilizing representatives/ associations of citizens and corporations to influence them
<p>Institutions</p> <ul style="list-style-type: none"> • Technical Chamber of Greece • Centre for Renewable Energy Sources • Research Institutions (e.g. National Observatory of Athens) 	<ul style="list-style-type: none"> • Develop energy policies and interventions 	<ul style="list-style-type: none"> • Technical Guidance/assistance • Decision-making power 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc. • Mobilizing representatives/ associations of

<ul style="list-style-type: none"> • Academic Institutions (e.g. University of Thessaly, Technological Educational Institute of Sterea Ellada) 			<p>citizens to influence them</p>
<p>Associations</p> <ul style="list-style-type: none"> • Associations of real estate owners (e.g. Hellenic Property Federation) • Associations of property developers (e.g. Federation of Property Developers and Construction Companies) 	<ul style="list-style-type: none"> • Building owners 	<ul style="list-style-type: none"> • Decision-making power • Technical Guidance/assistance 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc. • Mobilizing representatives/ associations of citizens and corporations to influence them
<p>Environmental NGOs</p> <ul style="list-style-type: none"> • Greenpeace • WWF • INZEB • Hellenic Passive House Institute 	<ul style="list-style-type: none"> • Develop energy policies and interventions 	<ul style="list-style-type: none"> • Technical Guidance/assistance 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc. • Mobilizing representatives/ associations of citizens to influence them
<p>Private Entities</p> <ul style="list-style-type: none"> • Energy Service Companies (ESCOs) • Banks and Financial Institutions 	<ul style="list-style-type: none"> • Implement energy efficiency interventions • Funding resources 	<ul style="list-style-type: none"> • Financial Resources 	<ul style="list-style-type: none"> • Increasing their information through conferences, public consultations, bilateral meetings, etc.

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

3.1 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 set under the prism of the Europe 2020 Strategy.

Within this framework, the Region of Sterea Ellada has conducted its Operational Programme for the period 2014-2020, with a total budget of € 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 Programme 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. € 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. € 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 following table.

Table 3: NSRF Projects/Grants (Thematic Objective “Eco-economy”) - Region of Sterea Ellada

	Title	Beneficiary	Budget
5029543	Improving Energy Efficiency and the use of more energy-friendly forms of energy in private buildings, complementary to the relevant action of the EPANEK	HELLENIC DEVELOPMENT 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 the Municipality of Karystos	MUNICIPALITY OF KARISTO	1,133,911 €
5039869	Energy Saving and Application Technologies SA at the General Hospital of Karpenissi	REGION OF CENTRAL GREECE	1,128,447 €
5029479	Energy upgrading of "Andreas Errikos Hatzopoulos" indoor Municipal Gym in the Municipality of Thebes	MUNICIPALITY OF THIVA	815,365 €
5029518	Energy upgrading of "Halkiopoulos" indoor sports hall of Lamia	MUNICIPALITY OF LAMIA	745,700 €
5029292	Interventions for energy upgrading and energy saving at the indoor basketball 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 - EDIPSOS	605,685 €
5041835	ENERGY UPGRADE OF THE 1st & THE 17th PRIMARY SCHOOLS & THE 17th NURSERY SCHOOL OF LAMIA	MUNICIPALITY OF LAMIA	489,244 €
5038582	ENERGY UPGRADE FIRST MIDDLE SCHOOL OF ORCHOMENOS	MUNICIPALITY OF ORCHOMENOS	450,000 €
5041823	ENERGY UPGRADE SECOND MIDDLE SCHOOL OF ORCHOMENOS	MUNICIPALITY OF ORCHOMENOS	370,500 €
5021774	Energy upgrading of outdoor swimming pool in Itea, Municipality of Delphi	MUNICIPALITY OF DELFI	337,307 €
5041825	ENERGY UPGRADE TOWN HALL OF ORCHOMENOS	MUNICIPALITY OF ORCHOMENOS	283,080 €
5038586	INTERVENTIONS FOR THE ENERGY UPGRADING AND ENERGY SAVING AT THE HIGH SCHOOL OF SKYROS	MUNICIPALITY OF SKIROS	197,160 €
5042920	UPGRADING ENERGY EFFICIENCY AND SAVINGS OF ACTIVITY IN JUNIOR JUNIOR HIGH SCHOOL OF THE MUNICIPALITY OF THEBES	MUNICIPALITY OF THIVA	192,550 €

Source: Ministry of Economy & Investments – Anaptyxi.gov

3.2 Mapping of policies

3.2.1 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).

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.

Table 4: EU Directives’ articles that affect the public setor

Directive	Article	Description
Energy Efficiency Directive (2012/27/EU)	Article 5 - Exemplary role of 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 public bodies	Central governments purchase only products, services and buildings with high energy-efficiency performance
	Article 7 - Energy efficiency obligation schemes	Each Member State shall set up an energy efficiency obligation scheme and ensure to achieve a cumulative end-use energy savings target. To attain the cumulative target, measures in

		the public sector could 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 of Buildings Directive (2010/31/EU)	Article 9 - Nearly zero-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 performance certificates	An EPC is issued for buildings where a total useful floor area over 500 m ² is occupied by a public authority and frequently visited by the public. On 9 July 2015, this threshold of 500 m ² shall be lowered to 250 m ²
	Article 13 - Display of energy performance certificates	Public authorities that frequently visited by the public, must ensure that the EPC is displayed in a prominent place clearly visible to the public.

Source: CEA

3.2.2 National Implementation of EU Directives 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.
- 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 general public takes place.
- The mandate for the Energy Performance Certificates of public buildings to be posted in public view.
- The initiation of measures, funding Programmes and other means to improve the energy efficiency of new and existing buildings. Incentives shall take into account 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 others:

- 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)
- 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)

3.3 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 on a National Level in order to enhance Energy Efficiency during the period 2014-2016.

Table 5: Energy Efficiency (ktoe) from interventions applied during 2014-2016

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

Athens Metro Expansion	-	29.30	-	-
Offsetting fines for arbitrary buildings	522 buildings	0.00	0.13	0.50
Energy Managers	204 buildings	-	-	1.19
Energy Performance Certificates	5,724 Energy Performance Certificates	2.09	3.51	2.26

Source: National Action Plan for Energy Efficiency

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

Table 6: Energy Efficiency (ktoe) from interventions decided to apply during 2017-2020

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

Source: National Action Plan for Energy Efficiency

Moreover, an ambitious strategy has been adopted by the Greek Authorities for the renovation of the sum of building stock in Greece, so that an energy renovation of 600,000 buildings (12% -15% of the total building stock) at a nZEB level to be accomplished by 2030.

To promote the renovation of the residential buildings stock, the Programme "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.

The creation of a National Record of all public sector buildings is currently underway.

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 Programme 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 Programme 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 Programme 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.

4. Policy – makers and Public Authorities Planning, Promoting and Implementing Initiatives of Improving Energy Efficiency in the Region of Sterea Ellada.

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, 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
- 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 7: NECP's summary of measures to improve energy efficiency

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

buildings) in the context of the new Programming period.		than public buildings	
Promotion of energy performance contracts (EPCs) in the private sector through targeted financing Programmes.	PP3.2, PP3.3, PP3.5	Tertiary sector - Buildings other than public buildings	Economic measure
Use of tax and town planning incentives for implementing energy savings interventions in residential buildings and tertiary sector buildings (other than public buildings).	PP3.2	Residential sector Tertiary sector, Buildings other than public buildings	Regulatory, economic measure
Mandatory installation of solar thermal systems in new buildings and in buildings undergoing major renovation.	PP3.2, PP3.11	Residential sector Tertiary sector, Buildings other than public buildings	Regulatory measure
Strengthening of the role and improvement of the regulatory framework for energy efficiency obligation schemes.	PP3.4	All final consumption sectors	Regulatory measure
Implementation of tender procedures for achievement of energy savings.	PP3.4	All final consumption sectors	Economic measure
Design of framework for setting up innovative technology procurement groups.	PP3.4	All final consumption sectors	Regulatory measure
Promotion of energy audits in SMEs and in households.	PP3.12	Industrial, tertiary and residential sector	Economic measure
Financing Programmes for the application of the recommendations of energy audits to obliged or non-obliged parties.	PP3.5, PP3.6	Industrial and tertiary sector	Economic measure
Promotion of energy management systems in SMEs.	PP3.2, PP3.6	Industrial and tertiary sector	Economic measure
Establishment of the National Energy Efficiency Fund.	PP3.5	All final consumption sectors	Regulatory, economic measure
Scheme for the certification of installers of building elements that affect the energy behaviour of buildings.	PP3.12	All final consumption sectors	Regulatory measure
Strengthening of the role of energy performance certificates by amending and upgrading them.	PP3.12	Tertiary and residential sector	Regulatory measure
Completion of a Programme for the installation of individual smart meters.	PP3.9, PP3.12	Tertiary and residential sector	Technical measure

Development of the regulatory framework for demand response.	PP3.9, PP3.12	All final consumption sectors	Regulatory measure
Financing Programmes for the energy upgrading of street lighting.	PP3.5	Tertiary sector	Economic measure
Financial and tax support for investment in energy savings technologies.	PP3.2, PP3.5, PP3.6	All final consumption sectors	Economic measure
Implementation of information actions on energy efficiency.	PP3.12	All final consumption sectors	Information and awareness-raising measure
Promotion of energy-efficient products through the implementation of energy labelling and of the eco-design Directive.	PP3.12	All final consumption sectors	Regulatory measure and information and awareness-raising measure
Promotion of green public procurement.	PP3.1, PP3.7	Public sector	Regulatory, economic measure
Financing Programmes for promoting HECHP, district heating/cooling in the context of the new Programming period.	PP3.5, PP3.11	All final consumption sectors	Economic measure
Expansion of natural gas distribution networks and deployment of autonomous compressed and liquefied natural gas networks	PP3.9	All final consumption sectors	Technical, economic measure
Promotion of innovative smart city models through the use of state-of-the-art technologies.	PP3.9	All final consumption sectors	Technical measure
Creation of database for energy characteristics of buildings and energy upgrading actions	PP3.12	All final consumption sectors	Information and awareness-raising measure
Financing Programmes for improvement in the energy efficiency of industries and processors in the context of the new Programming period, including the promotion of EPCs.	PP3.3, PP3.5, PP3.6	Industrial sector	Economic measure
Promotion of the relocation of industrial plants to industrial-business zones.	PP3.6	Industrial sector	Economic measure
Promotion of central heat generation and distribution systems at an industrial-business zone level	PP3.6	Industrial sector	Technical, economic measure
Compulsory quotas of vehicles with higher energy efficiency in the	PP3.1, PP3.7	Transport sector	Regulatory measure

fleets of public agencies or organisations.			
Promotion of use and improvement of energy efficiency of urban public transport systems.	PP3.8	Transport sector	Technical, economic measure
Implementation of infrastructure projects which are currently in progress in the (road and railway) transport sector.	PP3.8	Transport sector	Technical measure
Elaboration of sustainable urban mobility plans.	PP3.8	Transport sector	Regulatory measure
Elaboration of plans and implementation of infrastructures for a shift in commercial transport operations.	PP3.8	Transport sector	Regulatory measure
Use of tax incentives to promote alternative fuels in transport (biofuels, hybrid fuels, electric fuels, natural gas, LPG).	PP3.7, PP3.8	Transport sector	Economic measure
Completion of the institutional support framework for the deployment of infrastructures for promoting alternative fuels in transport (recharging stations for electric vehicles, natural gas, etc.)	PP3.7	Transport sector	Regulatory, technical measure
Implementation of a Programme for the replacement of passenger vehicles and light goods vehicles with new high energy efficiency ones.	PP3.7	Transport sector	Economic measure
Regulatory measures for energy savings in the transport sector	PP3.12	Transport sector	Regulatory measure
Promotion of measures for improving energy efficiency in electricity infrastructures.	PP3.9	Electricity infrastructure	Regulatory, technical measure
Promotion of measures for improving energy efficiency in natural gas infrastructures.	PP3.9	Gas infrastructures	Regulatory, technical measure
Promotion of measures for modernising water supply / sewage and irrigation infrastructures, to save both water and energy.	PP3.10	Water infrastructures	Technical, economic measure

Source: NECP

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:

- 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
- 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

Furthermore, on Municipal Authorities' level, fourteen (14) municipalities of the Region have joined 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 8: Policy Measures regarding Energy Efficiency – Chalkida’s Municipality Sustainable Energy and Climate Action Plan

Policy Measure / Initiative	Estimated Energy Savings (MWh/y)	Estimated Emissions’ Reduction (tns CO₂/y)	Budget (€)	Estimated Cost Savings (€/y)	Time schedule
Establishment of Energy Savings Department	5,699.96	2,435.01	540,000	680,000	2020-2030
Energy Audits in public buildings and pumping stations	112.39	84.76	130,000	10,000	2019-2021
Appointing energy managers in every municipal building	153.26	112.54	360,000	15,000	2020-2030
Creating a digital record of municipal buildings	38.31	28.13	100,000	3,000	2020-2022
Energy Refurbishment of public buildings	3,220.78	2,673.07	1,300,000	360,000	2019-2030
Establish an energy community for RES development	1,500.32	941.66	50,000	155,000	2021-2030
BMS installation in public buildings	202.88	161.60	240,000	19,000	2020-2025
Actions to inform users of municipal buildings for enhancing awareness and optimising the use of E/M equipment.	169.07	134.67	100,000	16,000	2019-2025
PVs installation on rooftops and on parking stations for net metering purposes	1,518.88	1,209.81	3,500,000	143,000	2021-2030
Streetlighting network upgrade (LED)	3,618.32	2,882.04	1,600,000	293,000	2019 -2030

Source: SECAP-Municipality of Chalkida

5. Analysis of the Regional and National Legal and Regulatory Framework in the Region of Sterea Ellada and Relevant Policy- Making Trends.

5.1 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).
- Joint Ministerial Decision (ΔΕΠΕΑ/οικ.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 ((Υ.Α. 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.

5.2 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 Sterea Ellada, fourteen (14) municipalities have joined the Covenant of Mayors Initiative.

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. Analysis of Relevant Strategies and their Objectives

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.

Table 9: Setting the energy savings objective under Article 7 of Directive (EU) 2018/2002

Year	Energy Savings on an annual basis (ktoe)										Cumulative 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

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 10: Mix of policy measures to attain the objective under Article 7 of Directive (EU) 2018/2002

Policy measure	Total cumulative EU (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 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
Total	7.299

Source: NECP

7. References

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Annex