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PACT OF ISLANDS

Sustainable Energy Action Plan

Pano Lefkara Municipality - Cyprus

12 December 2011

Brief Summary

The "Pact of Islands" (**ISLE-PACT** project) is committed to developing **Local Energy Action Plans,** with the aim of achieving European sustainability objectives as set by the EU for 2020, that is of reducing **CO_2 emissions by at least 20% through measures that promote renewable energy, energy saving and sustainable transport**.

The Cyprus Energy Agency is a participating partner in the ISLE-PACT project and has invited Cyprus local authorities to demonstrate their political commitment by signing the "The Pact of Islands"; agreement in order to achieve the EU sustainability targets for 2020.

Cyprus participation involves 12 Municipalities and 2 Communities, including Pano Lefkara Municipality.

Lefkara is a town of Larnaca and independent municipality of Cyprus, famous for its embroideries, the lefkaritika, and the silverware. The name comes from the white color of the limestone rocks of the mountains. The village is divided administratively into two parts, Pano Lefkara, forming municipality and the community of Kato Lefkara.

The year 2009 was designated as the year of referencing/recording energy consumption and CO_2 emissions in the Municipality's territory. According to actual consumption data collected by the Electricity Authority of Cyprus (utility), the oil companies, the Statistical Service of Cyprus, etc, the total energy consumption in 2009 in Pano Lefkara was 16.469 MWh. The largest consumer of energy in the municipality is transport with 9.817 MWh followed by the tertiary sector with 3.623 MWh.

The CO_2 emissions in 2009 attributable to the overall energy consumption in the municipality are 6.339 tons.

For the forecast of CO_2 emissions in the period 2010 to 2020, the scenario of expected evolution was established, where it was estimated that without taking any measures emissions will amount to 5.915 tons.

The Sustainable Energy Action Plan that was prepared for the Municipality includes additional measures / actions to achieve at least the European goal of combating climate change. That is, the measures that will be taken by the Municipality in addition to national measures in order to overcome the goal of reducing CO_2 emissions by at least 20% by 2020 with respect to the reference year 2009.

The proposed measures are split into the following categories:

Description	**Number**
Energy Saving in Municipality public buildings	3
Energy Saving via informational campaigns	8
Energy saving in transport	2
Energy saving in street lighting	1
Municipality investments in renewable energy sources	1
Development of green spaces	1

The estimated annual emissions reduction for 2020 by applying the above measures amounts to 646 tons. In addition, it was estimated that the impact on Pano Lefkara Municipality from

the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 842 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 1.487 tons, annual emissions for 2020 will be limited to 4.428 tons. That is, **30%** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2011 to 2020 amounts to €215.600. Funding for the implementation of the Energy Action Plan is expected to be taken from the following resources:

- Municipality budget
- Savings that will result from energy reduction measures in buildings, vehicles and street lighting in the Municipality.
- Revenues originating from Municipality investments on Renewable Energy technologies.
- Funding from the Grant Scheme of the Ministry of Commerce, Industry and Tourism for the promotion of Renewable Energy and Energy Conservation
- Potential funding from the Fund created for Emissions Trading Scheme.
- Potential funding from other European programs.
- Potential funding from the sustainable development and competitiveness program of the Planning Bureau.

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1 The ISLE-PACT Project

1.1 Introduction

The main objective of the ISLE-PACT project is the development of Local Sustainable Energy Action Plans, aiming at achieving European sustainability objectives as defined by the EU for 2020, namely a reduction of CO_2 emissions by at least 20% through measures promoting renewable energy, energy savings and sustainable transport. The duration of the project is set at 30 months, from 1st February 2010 until 31st July 2012.

The project coordinator is the organization Comhairle nan Eilean Siar (CnES) – The Outer Hebrides of Scotland. The project is funded by the European Commission, Directorate General for Energy.

EUROPEAN COMMISSION Directorate-General for Energy

Project participants are invited to demonstrate their political commitment by signing the "The Pact of Islands", a three-page document detailing all aspects and targets that will be set by the authorities of the islands in order to achieve the EU sustainability goals for 2020.

1.2 Commitments from signing the Covenant of Islands

The Covenant of Islands is a binding instrument on which the competent island authorities will adopt political commitments in order to achieve the Project objectives. The Covenant is a three-page text and is formatted in a similar way as the Covenant of Mayors, where the specificities of European island communities are taken into account. It signifies the start of a number of important objectives such as:

- Further implementation of EU targets for 2020, reducing CO_2 emissions by at least 20% in areas of implementation,
- The preparation of the Sustainable Energy Action Plan, which includes the original recording of emissions data (Baseline Emission Inventory), and outlines the methods for achieving the objectives,
- The preparation and submission of implementation reports at least every 2 years after the delivery of the final Sustainable Energy Action Plan for evaluation, monitoring and verification of individual goals,
- To organize Energy Days, in collaboration with the European Commission and other stakeholders (e.g. Cyprus Energy Agency), providing an opportunity for citizens to have direct contact with the subject and also to benefit directly from sustainable energy use, as well as informing the local media for individual developments in local action plans,
- Participation in various conferences and workshops organized by various European institutions in connection with the Covenant of Mayors and the Pact of Islands,
- Further implementation of energy investment in the project areas.

1.3 Participating Municipalities and Communities in Cyprus

In Cyprus, twelve (12) Municipalities and two (2) Communities have signed the Pact of Islands and therefore participate in the ISLE-PACT project:

Strovolos Municipality	**Idalion Municipality**
Agios Athanasios Municipality	**Latsia Municipality**
Lakatamia Municipality	**Paralimni Municipality**
Aglantzia Municipality	**Geri Community**
Larnaca Municipality	**Ergates Community**
Aradippou Municipality	**Psimolofou Community**
Polis Chrysochous Municipality	**Lefkara Municipality**

Figure 1 Signing ceremony of the Pact of Islands on the 20th January 2011 in Nicosia

1.4. Signing Ceremony of the Pact of Islands

The signing ceremony of the Pact of Islands was performed in the building of the Committee of the Regions in Brussels on 12th April 2011. The event was part of the European Sustainable Energy Week, 11-15 April 2011, which brings together over 5000 participants each year in Brussels and many others elsewhere in Europe with multiple conferences, exhibitions and specialized conferences.

Figure 2 Representatives of the EU islands, mayors of island communities and representatives of the island authorities along with Mercedes Bresso, President of the Committee of the Regions and Helen Mariano, General Secretary of CPMR (Conference of Peripheral and Maritime Regions)

2 Cyprus

Cyprus is the largest island in the eastern Mediterranean and is located south of Turkey. The two main mountain ranges are Pentadactylos in the north and Troodos in the central and south-western part of the island. Between them lies the fertile plain of Mesaoria.

Cyprus has always been a crossroads between Europe, Asia and Africa and bears traces of many successive civilizations: Roman theatres and houses, Byzantine churches and monasteries, castles from the era of the crusades and prehistoric settlements.

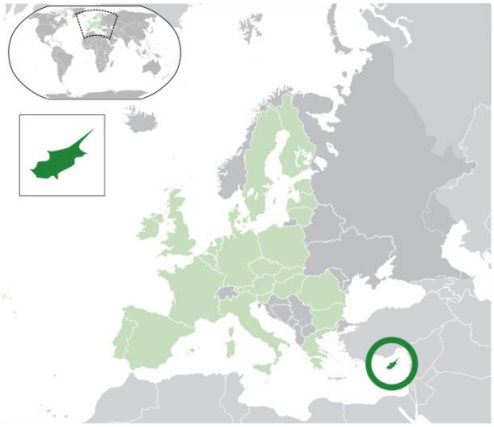
The main economic activities of the island are tourism, clothing and craft items exports and merchant shipping. Traditional crafts include embroidery, pottery and bronze.

Traditional specialties include *mezedes* - appetizers served as a main course - *halloumi* cheese and the drink of *zivania*.

After the Turkish invasion in 1974 and the occupation of the northern part of the island, the Greek and Turkish communities of Cyprus have been divided by the so-called Green Line.

Cyprus is known as the island of Aphrodite, the goddess of love and beauty, as according to legend, Cyprus is the birthplace of the goddess.

In modern literature the names of Costas Montis (poet and writer) and Demetris Gotsis (writer) stand out, while Evagoras Karageorghis and Marios Tokas are distinguished composers.



Πηγή: www.wikipedia.org

Year of EU entry:	2004
Political system:	Democracy
Capital:	Nicosia (Lefkosia)
Total area:	9.250 km²
Population:	0,8 million
Currency	euro

Source: http://europa.eu

3 Pano Lefkara Municipality

3.1 Introduction

Lefkara is a town of Larnaca and independent municipality of Cyprus, famous for its embroideries, the lefkaritika, and the silverware. The name comes from the white color of the limestone rocks of the mountains. The village is divided administratively into two parts, Pano Lefkara, forming municipality and the community of Kato Lefkara.

Lefkara is located on the southern slopes of the Troodos mountain range, at an altitude of approximately 500m, and located almost 40 km from the city of Larnaca.

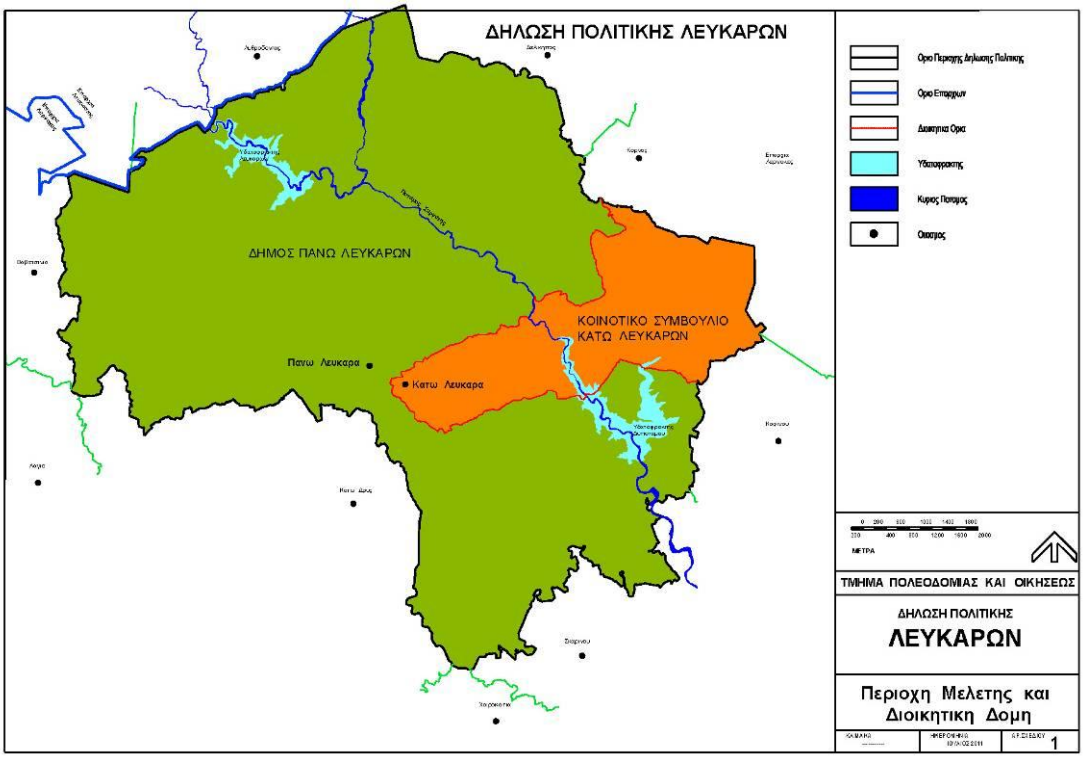


Figure 3 Lefkara Administrative Structure [Source: Lefkara Policy Statement]

Figure 4 Pano Lefkara Core – Satelite view [Source: Google Earth]

3.2 History

Historical sources reveal that several rulers of Cyprus have left their traces in Lefkara.

Around 1570 AD, when the Turks invaded in Cyprus to conquer the island, a large number of citizens found shelter in Lefkara, in order to escape the Turkish atrocities. However, it seems Lefkara was the first victim of the Turkish invasion, where, according to the written sources, a large number of people had been slaughtered in the church of the Holy Cross.

The English conquerors (1878 AD) declared the Municipality of Lefkara (1883 AD), which changed the whole course of development of the city.

Lefkara is known almost all over the world for its magnificent embroideries. The women of Lefkara embroidered initials these beautiful embroidery to decorate their homes. At a later stage, however, and by the end of the 19th century, they realized that these works of art could be sold to decorate the homes of people from other regions.

This idea gave way to the start of trading of Lefkara embroideries. With a suitcase full of lefkaritika laces in their hands, the villagers began to travel in all directions in order to sell their famous embroidery. Returning to the village with a respectable amount of money, the villagers realized that trade of lefkaritika was to become a major source of income for their families.

People from all over the world enjoyed the lefkaritika and this great love was kept alive over the centuries. Even today, seeing the women of Lefkara to embroider in the narrow streets, made fun of each passerby. The lefkaritika embroidery, beautiful embroidery used by generations of people all over the world to decorate and beautify their homes are still popular, admirable and used in the same way today.

And while women of Lefkara expressed artistically, creating beautiful embroidery, men of Lefkara with a sense of art decorate the particular art the kapnistomerrecha, silver spoons and many other works of art with silver. The art of silver, still flourishing today in Lefkara. In the heart of the village is the church of the Holy Cross, which dates from the 14th century AD. Feature of the church is the wooden iconostasis from 1760 AD. According to tradition, the large silver cross, bring a piece of the Holly Cross, which is kept in the crypt of the sanctuary.

Every corner of Lefkara has deep connection to Christianity by many historic churches, which are scattered around every neighborhood of the village.

Lefkara as a whole, is a living museum, where visitors may, in every corner of the village, feel the experience of living in earlier periods. The Folk Art Museum is the most representative sample of Folk Architecture, which features Lefkara. The museum is a 19th century mansion (Patsalos house), where time has stopped and reminds the visitor the past. The sofas, large carved wooden mirrors, old beds, and costumes of the house of the officer and noble, are some of the wonderful exhibits. The pride of the museum, however, is the old collection with lefkaritika of 19th century exposed to one of the rooms, offers fine art pieces for the lovers of silver everywhere.

[Source: www.lefkara.org.cy].

Figure 5 Trade development of embroidery at Lefkara

[Source: www.lefkara.org.cy]

Figure 6 Woman of Lefkara who weaves traditional embroidery

[Source: www.lefkara.org.cy]

Figure 7 Panoramic view of Pano Lefkara Municipality

[Source: www.lefkara.org.cy]

Figure 8 School of Pano Lefkara

[Source: www.lefkara.org.cy]

Figure 9 Pedestrian area of Pano Lefkara

[Source: www.lefkara.org.cy]

Figure 10 Traditional streets

[Source: www.lefkara.org.cy]

Figure 11 Traditional streets
[Source: www.lefkara.org.cy]

Figure 12 Traditional lefkaritiko

[Source: www.lefkara.org.cy]

Figure 13 Traditional houses
[Source: www.lefkara.org.cy]

Figure 14 Panoramic view of Pano Lefkara

[Source: www.lefkara.org.cy]

Figure 15 Pedestrian area of Pano Lefkara

[Source: www.lefkara.org.cy]

3.3 Policy Statement of Lefkara

3.3.1 Introduction and Purpose

The area of Policy Statement of Lefkara covers the administrative areas of Pano Lefkara Municipality and Community Council of Kato Lefkara. The extent of the area exceeding 6000 hectares.

The policy statement is to establish and implement long-term planning policy will facilitate the rational development of Lefkara 2016.

3.3.2 Traffic Policy

Within completion of the existing road network, provision the construction of new roads that serve as some rings around the central regions of the two settlements to better distribution of traffic and convenient and easy access to the various deployments of the areas which serve. Provided two such roads, the Siding of Pano Lefkara, which is part of the regional road network and whose course follows, in part, existing roads and the local importance Siding of Kato Lefkara, such as those shown in Figure 16.

Inside the two settlements, especially of Pano Lefkara, some local axes facilitate the perimeter traffic around of the historic cores, while other, less important roads, ensure the basic connections between the central neighborhoods.

To ensure the preservation and promotion of the intermediate landscape and picturesque route between Pano and Kato Lefkara for upgrading the existing road connecting the two settlements in 'environmental axis', which is functionally related to the network of green spaces and paths of nature and culture, as described in the relevant chapter.

In traffic management measures and recession include directing traffic at the perimeter of the central areas of settlements, one-way, to create a network with pedestrian paths to connect benchmarks, road construction traffic downturn, where priority will be given to pedestrians, and policing of parking.

Moreover, these measures will also help revitalize both traditional settlements, with the utilization and promotion of historic buildings that are reference points. Furthermore, with the implementation of specific measures, such one-way, pedestrianization and traffic

downturn will create the conditions for forming the central square, free traffic movement between the Town Hall and School in Pano Lefkara.

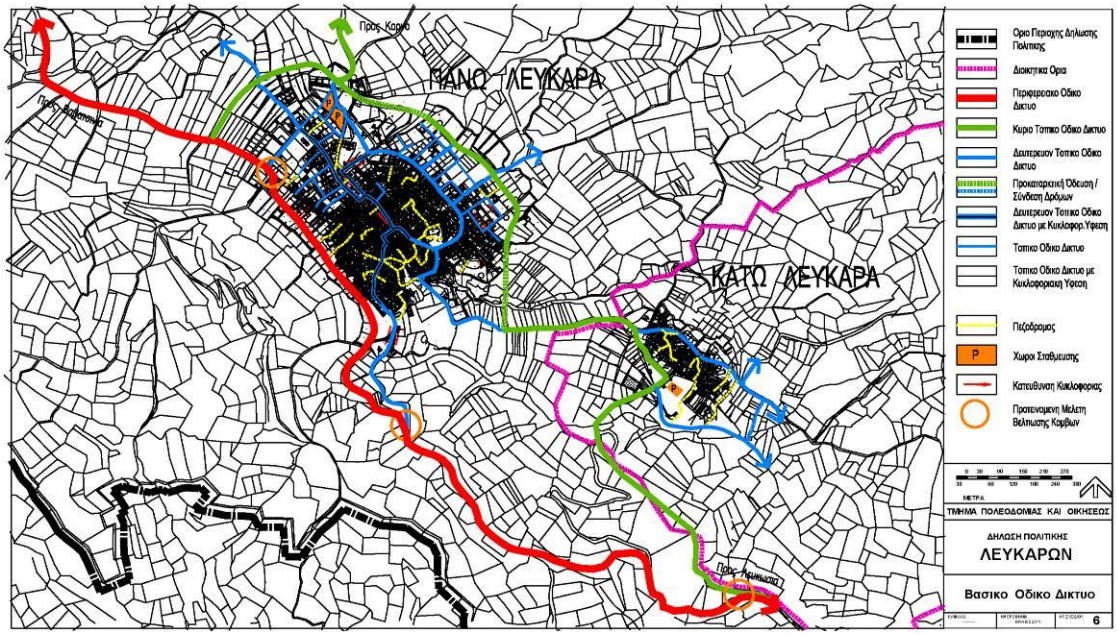


Figure 16 Basic Road Network of Lefkara [Source: Policy Statement of Lefkara 2011]

3.3.3 Pedestrian paths network

For the implementation of the traffic policy, adopted the following measures to encourage and facilitate the movement of pedestrians, especially small paths and middle distance:

(a) Design and implementation of full network "traffic roads recession", where cars and pedestrians coexist, but with such arrangements and configurations so that pedestrians have priority, as shown in Figure main roads.

(b) Establishment of a network of areas without cars (squares, streets, neighborhoods) and linking of residential areas with schools, places of reference and activity centers, both in the execution of projects in existing neighborhoods, as well as to start promoting the necessary infrastructure designing new areas.

3.3.4 Parking

To address the problem of parking, particularly in Pano Lefkara, created parks in strategic locations around the perimeter of the central region, which include multilevel parking at the northwest edge of the village of Pano Lefkara, Bus parking beside him and big space parking at the entrance of Kato Lefkara.

3.3.5 Urban Development Areas

In the area of Lefkara, residential development allowed in the following zones:

(a) in the traditional cores of settlements (with code "PA" in Urban Areas Project) including the specified regions of commercial activities with the code "Eb".

(b) in the designated residential zones (with the password "Ka" Plan Urban Areas), and as described in section 2.3 "Special Policy Areas."

In areas outside the Limit Development, residential development is not permitted, except in cases involving individual housing construction.

Policy on traditional core

To achieve the goal of quality improvement and revitalization of the two traditional cores, through the preservation and promotion of the remarkable architectural character, the Statement Policy assistance implementation of the following policies:

(a) The qualitative upgrading of the two traditional cores, by promoting public and private investment in infrastructure and urban projects.

(b) The improvement and renewal of the housing stock in these cores with the appropriate information and encourage the owners of listed buildings for the use of financial inducements (subsidies, tax breaks, building factor etc.).

(c) The maintenance and restoration of traditional buildings through various measures and programs

(d) The training of specific programs aimed at the design, implementation, management and coordination, the two cores of the necessary infrastructure for quality improvement and promotion of the architectural heritage.

(e) The introduction of specific guidelines for the restoration of traditional buildings and the appropriate integration of new buildings in the traditional environment, in cores and around them, in order to reduce interference and false unmatched maintenance and harmonization of new buildings with architectural and urban character of settlements.

(f) The adjustment of the residential areas around the traditional cores and application specific policy in selected areas in order to be able to protect the two entities and urban landscape that surrounds them.

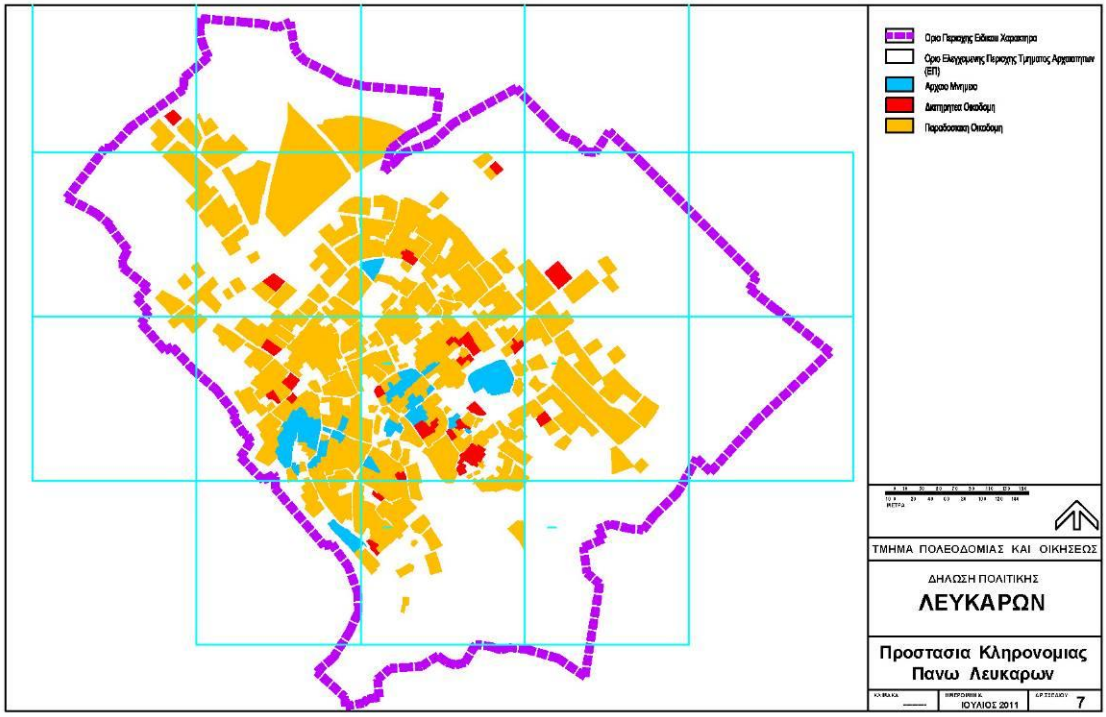


Figure 17 Heritage protection area of Lefkara [Source: Policy Statement of Lefkara 2011]

3.3.6 Special policy for the environment and landscape

The landscape is recognized as a key element of the natural environment as an expression of the diversity of cultural and natural heritage and identity as the basis of Lefkara. In pursuit of

developing and implementing policy that aims to protect, manage and design the landscape in this Policy Statement, specific provisions for the landscape incorporated into land-use planning and development control process, while imported supportive legal, administrative, and economic tools and measures, and promotes the identification, recording and evaluation of different types of landscape and setting the desired quality objectives.

The main objectives of the landscape policy are:

(a) The conservation of natural and cultural heritage of the landscape and the implementation of ideas and principles that govern the design and management, according to the European Landscape Convention.

(b) The achievement of sustainable development in the region, based on the balanced and harmonious relationship between social needs, economic activity and the environment.

(c) The enhancement of the landscape in desirable source of economic activity, with a significant role in the social, cultural, environmental and ecological issues, and the promotion of cooperation of the society for the protection, management and planning.

(d) The recognition of the quality and diversity of the landscape of the area of this Policy Statement as key dimensions of identity and local character of Lefkara, but also as shared resources for the whole of Cyprus.

(e) The treatment of landscape as a key contributor to the quality of life of the residents of Lefkara and, consequently, the protection and preservation of the environment from any pressure and negative changes can cause this development in agriculture, industry, tourism or recreation, and infrastructure projects and planning.

The Policy Landscape based on the European Landscape Convention (Florence, 2000), promoted by the Council of Europe and a development effort to protect and preserve the world's heritage, complementing the existing international law.

Crucial step for the success of the Policy Landscape, beyond the adoption level planning is the parallel implementation of specific policies and measures by sector (eg public works, agriculture, local government, telecommunications) and recognition of values and importance of all stakeholders and authorities.

General Policy for Conservation of Landscape and Environment

Aiming to preserve areas of this Policy Statement characterized by high ecological and cultural value, and the rational management of natural resources in the area, the planning policy in relation to the landscape and the environment provides for the following:

(a) The strict protection of the areas defined by the code "Da1" Plan 4 "Planning Zones of Policy Statement of Lefkara" as "Nature Conservation Areas". In this category fall the portions of state forests Macheras, Aetomouttis and Kakoratzias and in the area of this Policy Statement, and the areas around the dams of Lefkara and Dipotamos and around notable peaks, cliffs, gorges, riverbeds and geological formations. In these areas there is preliminary point presumption against any development which may adversely affect the landscape and environment.

(b) The protection of areas defined by the code 'Da2' Plan 4 'Planning Zones of Policy Statement of Lefkara "as" Protected Landscapes. "In these areas fall within the forested areas in the north of Pano Lefkara and east of Kato Lefkara, and other areas with strong topographic or other special features. In these areas, the following developments are permittedprovided that preserve their value as habitat for local flora and fauna, landscape quality, the topographical features, natural runoff of rainwater etc.

(c) The inclusion of fertile irrigated farmland valley Syrgati, like other areas where there is a need to preserve open spaces or cemeteries, or isolate specific areas (eg around or craft and Stockbreeding Areas in along roads, etc.), protection zones defined in Figure 4 'Planning Zones of Policy Statement of Lefkara' with password' Da3 "where only allowed to perform work related to agriculture or development and strengthening of the local flora provided that ensure the inclusion of any permitted development on the environment and character of the landscape, with the minimum necessary structures.

(d) To protect the area, which is shown in Figure 3, "Land Use Central Region" with green lines (School Zone "Da1" and "Da2") and extends between the boundaries of the two settlements with the community Kato Drys, which joined in the European network protection «NATURA 2000», with overall objective to conserve biodiversity through appropriate protection of natural habitats. Specifically, this area is an important habitat for native flora and wildlife, covered with garigue vegetation dominated Mediterranean herbs, and shrublands, dominated the Cypriot aspalathos (Genista sphacelata, commonly known as "rasin"), and connected to the south, with woodland and wild olive and carob,and west of the village of Kato Drys, a remarkable cluster of oaks.

It also includes all of the area where it is located the protected by the Bern Convention endemic Astragalus macrocarpus var. leukarensis and the rare and endangered species of Fritillaria persica, which Cyprus has been detected only in the specific area of Lefkara, while not found in any other country in the European Union . Regardless of what is allowed in Zones "Da1" and "Da2" in their departments within the range «NATURA 2000» will not allow any development projects other than protection and promotion of the area, but only after the consent of the Director of environmental department.

(e) The protection of important trees and tree stands on private land in accordance with the provisions of section 39 of the Town Planning and Housing Law by issuing Decree to Protection Trees in the interest of the region lures.

(f) The maintenance and restoration of landscape features such as stone structures or retaining walls etc.

In addition to the above, in the design and execution of projects authorized in the above areas should take all necessary measures to limit the negative impact on the environment and its restoration to the greatest extent possible, upon completion of construction operations.

3.3.7 Parks and Green Spaces

In this Policy Statement provision the study for a network of green spaces of various scales and types, with the target material quality of life of residents and offer to them and visitors a variety of recreational opportunities.

In managing and viewing of important habitats in the immediate vicinity of the two settlements, landscape interval between them and the mountain of Sotiras that dominates the Lefkara, proposed to create two corresponding local park with Nature Trails and observation points of the landscape limiting interventions to the minimum necessary and determining the points where traffic will be allowed visitors, through developing integrated study with the contribution of all relevant scholarly disciplines. At the same time, welfare the completion of the network of parks and green spaces in built up area, creating playgrounds and similar natural formations and facilities for various user groups at selected points of the two settlements, and their connection with the residential areas, schools and sports venues, through a system of local footpaths

[Source: Policy Statement of Lefkara 2011].

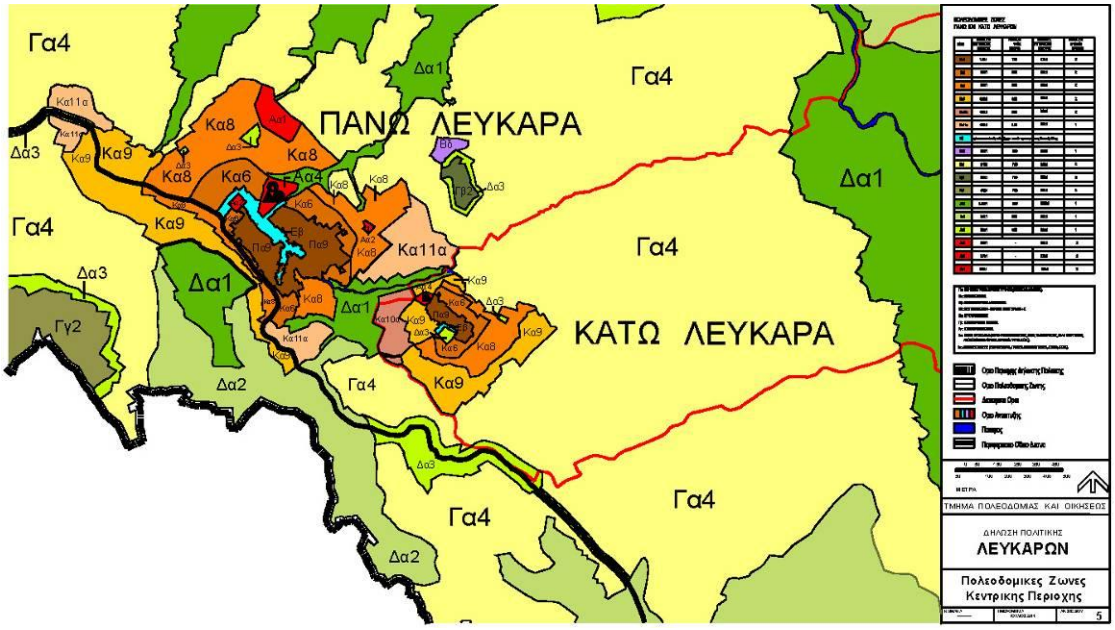


Figure 18 Planning scheme of Lefkara [Source: Policy Statement of Lefkara 2011]

4 Current Status at Pano Lefkara Municipality

4.1 Description of consumption of public buildings

The total electricity consumption in buildings of municipal services amounted in 2009 to 42.937 kWh. At school of the Municipality the electricity consumption for the same year amounted to 97.392 KWh.

4.2 Pano Lefkara Municipality Street Lighting

According to data from the EAC, the total energy consumption in 2009 for street lighting was equal to 134.505 kWh.

The type and power of lamps are shown in the table below:

Trade 1 Bulbs type in the building of Pano Lefkara Municipality

Bulb Type	Power
HPS *	250 W
HPS	150 W
HPS	70 W
Compact	21 W

* High Pressure Sodium

Street lighting operating Hours: According to the EAC, the bi-monthly tariff of street lighting is Code 35. Based on this tariff electricity for the lamps will be provided daily from half an hour after sunset until half an hour before sunrise.

The period of power supply can be increased from sunset to sunrise if requested by Pano Lefkara Municipality.

4.3 Public Transport

Public transport relating the connection of Lefkara and the urban center of Larnaca (Through Kofinou Station) and other communities in the region, conducted by the firm Zenon Buses.

The policy followed is based on significantly improving the efficiency of the public transport system, which will help to gradually reduce traffic congestion and reduce emissions of CO2.

The routes serve Lefkara shown below:

Trade 2 Public Transport which connect the municipality of Pano Lefkara

[Source: www.zinonasbuses.com]

DAILY **Route 405:** Vavatsinia – P. Lefkara – K. Lefkara– Skarinou – Kofinou Station	
Route Hours	Route Hours
05:45	06:30
07:45 (Pano Lefkara Start)	09:00
08:15	12:45 (Pano Lefkara Terminal)
15:45	14:30
	17:45

SATURDAY – SUNDAY AND HOLIDAYS **Route 405:** Vavatsinia – P. Lefkara – K. Lefkara – Skarinou – Kofinou Station	
Route Hours	Route Hours
07:45	08:30
10:15	11:00
14:30	15:15

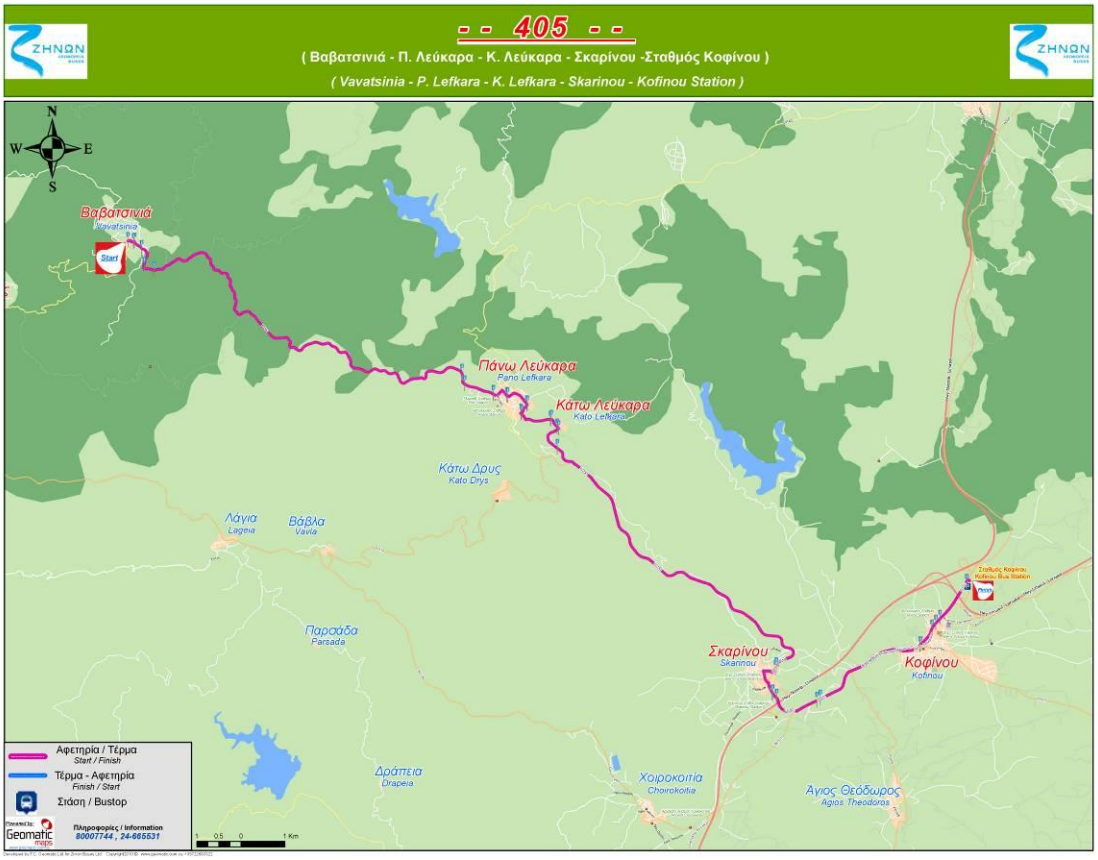


Figure 19 Regional bus routes serving the Municipality of Pano Lefkara

[Source: www.zinonasbuses.com]

4.4 Number of residences

According to the 2011 census, in the Municipality of Pano Lefkara there are 362 homes vacant or temporary residence and 323 permanent residence.

4.5 Population

The number of population in Pano Lefkara according to the census of 2001 was 921

4.6 Green procurements

The Municipality of Pano Lefkara in notices for purchase of goods and services promotes green procurement in areas such as purchasing energy efficient computers, recycled paper, etc.

4.7 European and International Programs

The Municipality of Pano Lefkara participates in the following European and international programs, some of which are co-funders:

Covenant of Mayors A European Committee initiative for the creation of a permanent collaboration network between European Cities to combat climate change. The municipalities are bound to achieve the European objectives for a reduction of CO2 emissions by at least 20% through measures promoting renewable energy, energy savings and sustainable transport.	Σύμφωνο των Δημάρχων Υπέρ της Τοπικής Βιώσιμης Ενέργειας	www.eumayors.eu
Covenants of Islands ISLE-PACT aims at developing Sustainable Energy Action Plans in Islands, in order to achieve the European objectives for a reduction of CO2 emissions by at least 20%	ISLEPACT SUSTAINABLE ENERGY ACTIONS FOR ISLANDS	www.islepact.eu
Medeea The general scope of Meddea Project is to achieve the European goal "20-20-20" in the Mediterranean, through the involvement of local authorities in energy related matters by applying the energy planning tool, European Energy Award-eea®	medeea	www.interregmedeea.eu

5 Inventory of Energy Consumption in Pano Lefkara Municipality

5.1 Residential Sector

Trade 3 Energy Demand in MWh in the Residential Sector in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot water	49	43	3	200	2	11	**308**
Heating and cooling	1.182	705	83	6	4	104	**2.084**
Lighting	66	-	-	.	-	-	**66**
Kitchen	49	-	21	.	-	-	**70**
Electrical appliances	29	-	-	.	-	-	**295**
Total	**1.641**	**748**	**107**	**206**	**6**	**114**	**2.823**

5.2 Primary Sector

Trade 4 Energy Demand in MWh in the Primary Sector in 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestries and Fisheries	50	28	0	19	20	**118**
Mining and Quarrying	0	0	0	0	0	**0**
Total	**50**	**28**	**0**	**19**	**20**	**118**

5.3 Secondary Sector

Trade 5 Energy Demand in MWh in the Secondary Sector in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Processing	30	17	12	-	-	**59**
Water supply, wastewater treatment, waste management	12	7	5	-	-	**24**
Construction	3	2	1	-	-	**5**
Total	**45**	**25**	**17**	**-**	**-**	**88**

5.4 Tertiary Sector

Trade 6 Final Energy Consumption in MWh in the Tertiary Sector for the Year 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	281	158	108	12	4	**563**
Hotels and restaurants	124	69	48	5	2	**248**

Public administration and social insurance	43	24	16	2	1	**86**
Defence, Justice, Police and Fire stations/departments	917	515	352	39	13	**1.837**
Education	97	55	37	4	1	**195**
Human Health and social care	77	43	29	3	1	**153**
Other Services	203	114	78	9	3	**407**
Public Lighting	135	-	-	-	-	**135**
Total	**1.877**	**978**	**669**	**75**	**25**	**3.623**

5.5 Transport

Trade 7 Final Energy Consumption in MWh in Transports for the Year 2009

Description	**Electricity**	**Diesel**	**Gasoline**	**Biomass**	Total
Urban and suburban passenger transports	1	100	93	-	**194**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	1.599	1.482	62	**3.142**
Commercial ground transportation services and removable services	-	0	-	-	**0**
Private Vehicles	-	3.297	3.057	127	**6.481**
Total	**1**	**4.996**	**4.632**	**189**	**9.817**

5.6 Total Final Energy Consumption in the Municipality of Pano Lefkara

Trade 8 Final Energy Consumption in MWh in 2009

Sector	**Electricity**	**Fuel Oil**	**Diesel**	**Gasoline**	**LPG**	**Solar**	**Geothermal**	**Biomass**	Total
Residential	1.641	748	-	-	107	206	6	114	**2.823**
Primary	50	28	-	-	19	-	-	20	**118**
Secondary	45	25	-	-	17	-	-	-	**88**
Tertiary	1.877	978	-	-	669	75	-	25	**3.623**
Transports	1	-	4.996	4.632	-	-	-	189	**9.817**
Total	**3.614**	**1.779**	**4.996**	**4.632**	**812**	**281**	**6**	**348**	**16.469**

Figure 20 Share of Final Energy Consumption by Sector in 2009

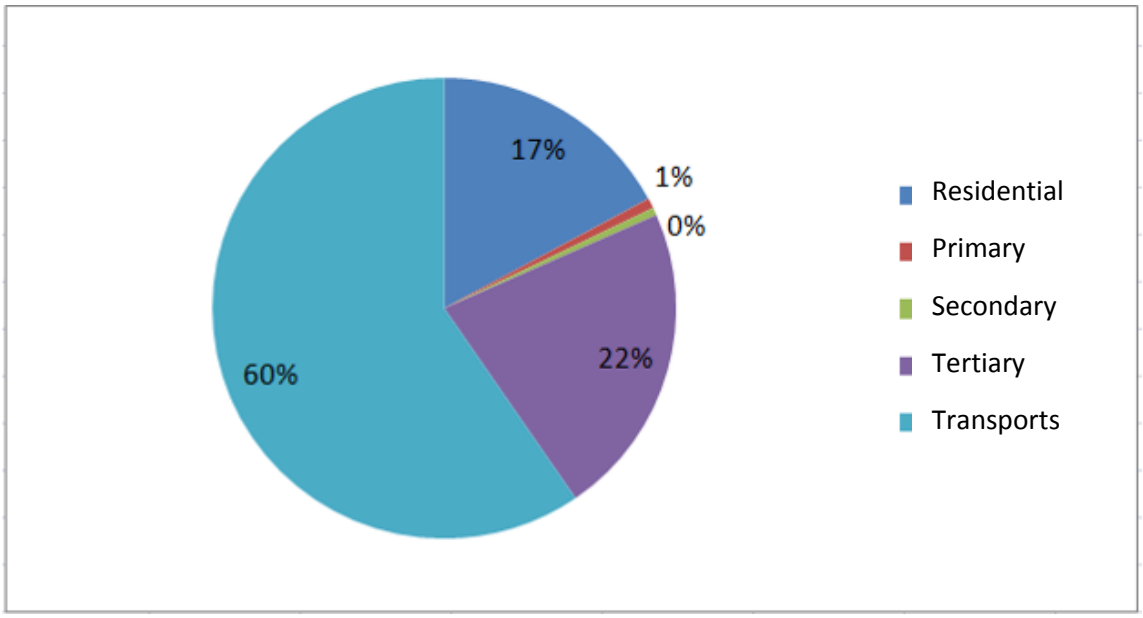
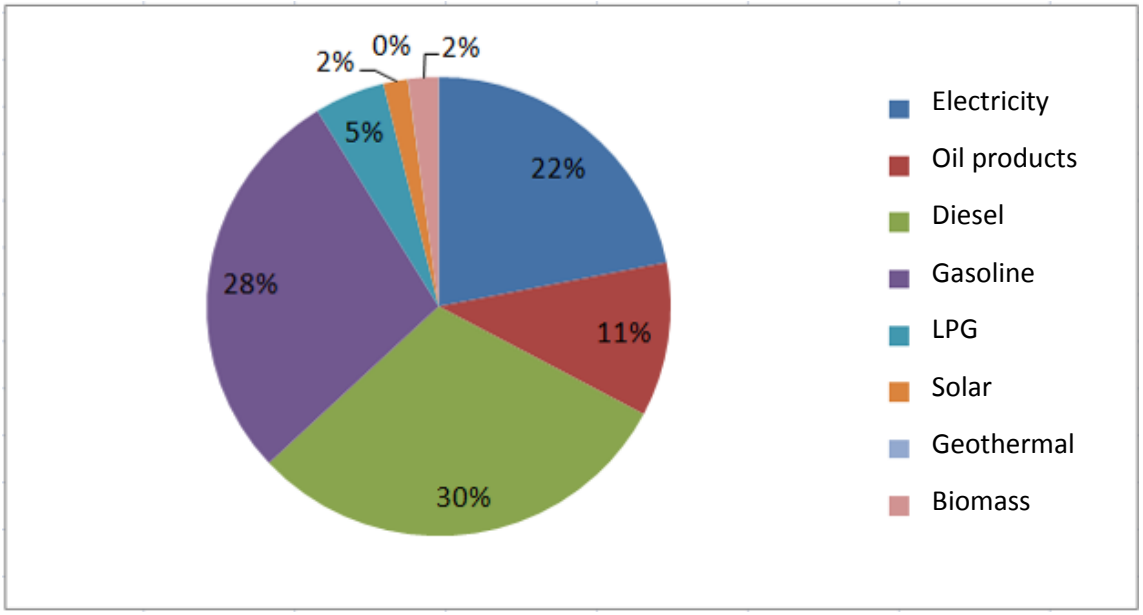


Figure 21 Share of Final Energy Consumption by Energy Source in 2009



6 Inventory of Carbon Dioxide (CO2) Emissions at Pano Lefkara Municipality

6.1 Introduction

Carbon dioxide emissions were calculated using standard emission factors on consumption based on the energy source and use. According to these factors Renewable Energy Sources (RES) are considered to have zero carbon emissions.

Trade 9 Coefficients for Calculating CO2 Emissions

	Energy Source	IPCC emission factors
FOSSIL FUELS	Fuel oil	0,279
	Diesel	0,267
	Gasoline	0,249
	Natural Gas	0,202
	LPG	0.240
	Electricity	0,874
RENEWABLE ENERGY SOURCES	Wind	0
	Hydro	0
	Solar	0
	Geothermal	0
	Biomass	0

6.2 Residential Sector

Trade 10 CO2 Emissions in tones in the Residential Sector of Pano Lefkara Municipality in 2009

Description	Electricity	Fuel Oil	LPG	SOLAR	Geothermal	Biomass	Total
Hot water	43	12	1	-	-	-	**56**
Heating and cooing	1.033	197	20	-	-	-	**1.249**
Lighting	57	-	-	-	-	-	**57**
Kitchen	43	-	5	-	-	-	**48**
Electrical appliances	258	-	-	-	-	-	**258**
Total	**1.435**	**209**	**26**	**-**	**-**	**-**	**1.669**

6.3 Primary Sector

Trade 11 CO2 Emissions in tones in the Primary Sector of Pano Lefkara Municipality in 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculturee, Forestries and Fisheries	44	8	-	5	-	**57**
Mining and Quarring	-	-	-	-	-	**-**
Total	**44**	**8**	**-**	**5**	**-**	**57**

6.4 Secondary Sector

Trade 12 CO2 Emissions in tones in the Secondary Sector of Pano Lefkara Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Processing	26	5	5	-	-	**36**
Water supply, wastewater treatment, waste management	11	2	-	-	-	**14**
Construction	2	-	-	-	-	**2**
Total	**39**	**7**	**5**	**-**	**-**	**51**

6.5 Tertiary Sector

Trade 13 CO2 Emissions in tones in the Tertiary Sector of Pano Lefkara Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	246	44	26	-	-	**316**
Hotels and restaurants	108	19	11	-	-	**139**
Public administration and social insurance	38	7	4	-	-	**48**
Defence, Justice, Police and Fire stations/ departments	802	144	84	-	-	**1.030**
Education	85	15	9	-	-	**109**
Human health and social care	67	12	7	-	-	**86**
Other services	178	32	19	-	-	**228**
Public lighting	118	-	-	-	-	**118**
Total	**1.641**	**273**	**160**	**-**	**-**	**2.074**

6.6 Transport

Trade 14 CO2 Emissions in for Transports in Pano Lefkara Municipality in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transports	1	27	23	-	**51**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	427	369	-	**796**
Commercial ground transportation services and mobile services	-	-	-	-	**-**
Private vehicles	-	880	761	-	**1.642**
Total	**1**	**1.334**	**1.153**	**-**	**2.488**

6.7 Total CO2 emissions in Pano Lefkara Municipality

Trade 15 Total CO2 emissions in Pano Lefkara Municipality in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	1.435	209	-	-	26	-	-	-	**1.669**
Primary	44	8	-	-	5	-	-	-	**57**
Secondary	39	7	-	-	5	-	-	-	**51**
Tertiary	1.641	273	-	-	160	-	-	-	**2.074**
Transports	1	-	1.334	1.153	-	-	-	-	**2.488**
Total	**3.160**	**497**	**1.334**	**1.153**	**196**	**0**	**0**	**0**	6.339

Figure 22 Share of CO2 Emissions by Sector in 2009

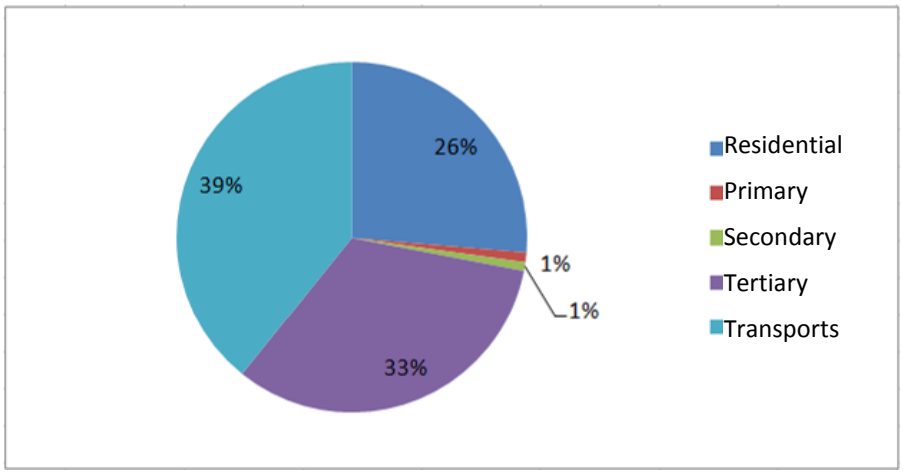
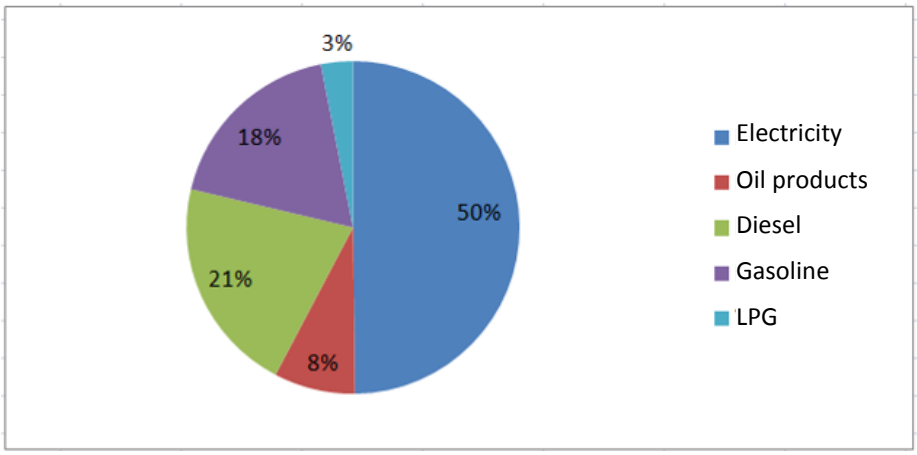


Figure 23 Share of CO2 Emissions by Energy Source in 2009



6.8 Forecasting/Projection Scenario of CO2 Emissions

For the forecasting/projection of CO_2 emissions in the period 2010 to 2020, a scenario of expected evolution was compiled, which includes the following main assumptions:

1. Use of annual growth rates of energy consumption per sector based on the statistics available during the preparation of the Energy Action Plan (see Table 16)
2. Use of annual growth rates of energy efficiency at the end-use due to the improvement of existing technologies (see Table 17)
3. Estimation of the coefficient of performance of Cyprus Power Plants in subsequent, years, taking into account the technology improvement and the modernization of the existing equipment (see Table 18).
4. The gradual introduction, use and integration of natural gas into the power generating system.

Trade 16 Growth Rates of Energy Consumption per Consumer used in the expected evolution scenario

Sector Descripion	Estimated annual energy consumption rate
Residential	
Hot water	1,0%
Heating and Cooling	1,0%
Lighting	1,0%
Cooking	1,0%
Refrigerators and freezers	1,0%
Washing and drying machines	1,0%
Dishwashers	1,0%
Televisions	1,0%
Other electrical appliances	1,0%
Primary Sector	
Agriculture, forestry and fisheries	0%
Mining and quarring	0%
Secondary Sector	
Processing	1,0%
Water supply, wastewater treatment, waste management and remediation activities	1,5%
Construction	2,5%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	2,0%
Accommodation services activities and food services	2,0%
General public administration and social insurance	2,0%
Defense and justice services, police and fire stations/ departments	2,0%
Education	2,0%
Activities related to human health and social care	2,0%

Other services	2,0%
Municipal/ Public lighting	20%
Transports (vehicles)	
Private transports	1,0%
Urban and suburban passenger transports	1,5%
Other road transport services (taxi, tourism, school buses, etc.	0,0%
Freight road transports and removal services	2,0%
Secondary energy production	
Solar energy for electricity generation	2,0%
Wind energy for electricity generation	1,0%
Solar energy for heating and cooling	0,0%
Geothermal energy for heating and cooling	1,0%
Heating from Biomass	2,5%

Trade 17 Increased Efficiency in Energy End-use (Reducing the Final Energy for the same Useful Energy)

Sector Description	**Estimated annual energy consumption rate**
Residences	
Hotwater	0,5%
Heating and cooling	0,5%
Lghting	0,5%
Cooking	0,5%
Refrigerators and heaters	0,5%
Washing and drying machines	0,5%
Dishwashers	0,5%
Televisions	0,5%
Other electrical appliances	0,5%
Other services	0,5%
Municipal/ Public lighting	0,5%
Transprts (Vehicles)	
Private transports	0,5%

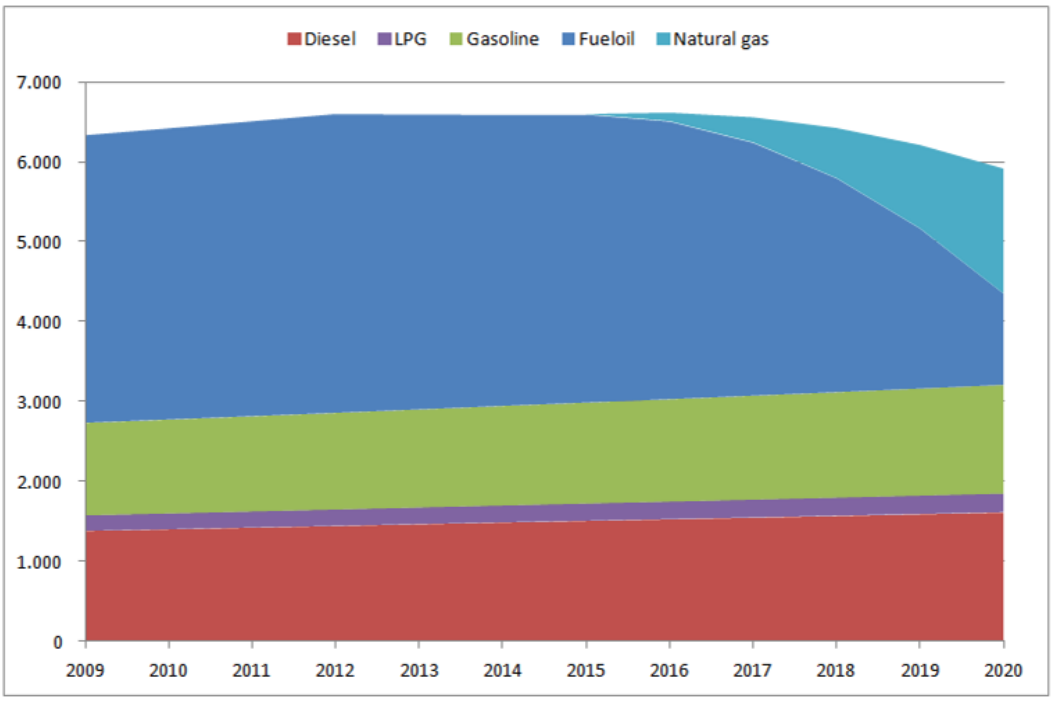
Trade 18 Coefficients of Energy Performance of Electricity Generation

	2010	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Fuel Oil	32%	32%	32%	33%	34%	35%	35%	35%	35%	35%	35%
Diesel	25%	25%	25%	25%	25%	26%	27%	28%	29%	30%	31%
Natural Gas	-	-	-	-	-	43%	43%	43%	44%	44%	44%

Trade 19 Expected Evolution Scenario for Forecasting CO2 Emissions for the Period 2009 - 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Percentage increase based on 2009
2009	3.602	1.388	1.153	196	0	6.339	0%
2010	3.647	1.409	1.170	199	0	6.426	1%
2011	3.694	1.430	1.188	202	0	6.514	3%
2012	3.742	1.451	1.205	206	0	6.604	4%
2013	3.692	1.472	1.223	210	0	6.597	4%
2014	3.646	1.494	1.241	213	0	6.595	4%
2015	3.606	1.514	1.260	217	0	6.596	4%
2016	3.476	1.534	1.279	221	104	6.613	4%
2017	3.167	1.555	1.298	225	312	6.556	3%
2018	2.677	1.576	1.317	229	624	6.422	1%
2019	2.003	1.597	1.336	233	1.040	6.210	-2%
2020	1.143	1.619	1.356	237	1.560	5.915	-7%

Figure 24 Expected Evolution Scenario for Forecasting CO2 Emissions for the Period 2009 -2020



7 Pano Lefkara Sustainable Energy Action Plan from 2011 to 2020

7.1 Introduction

The Sustainable Energy Action Plan that has been prepared for Pano Lefkara Municipality includes additional measures/actions so as to achieve at least the European goal of combating climate change. This includes measures taken by the Municipality, in addition to national measures, to overcome the goal of reducing CO_2 emissions by at least 20% by 2020 compared to the reference year 2009.

Emissions Reference Year 2009 (tn CO_2/year)	Expected annual emissions in 2020 (tn CO_2/year)	Minimum emissions target in 2020 (tn CO_2/year)	Desired minimum (20%) emissions reduction (tn CO_2/year)
6.339	5.915	5.071	844

Although the contribution of national measures is estimated and included in the Sustainable Energy Action Plan, the municipality cannot determine the achievement of National Goals. However, several of the measures proposed to be implemented at a local level, will support and complement national measures, in order to enable the achievement of the main objectives.

The measures are divided in the following main areas:

- Energy saving in public buildings
- Energy saving through awareness raising campaigns
- Energy saving in transports
- Energy saving in street lighting
- Investments in Renewable Energy Sources (RES)
- Development of green spaces

7.2 Energy saving in the public buildings

Measure ENEF 1 – Thermal Insulation

The indirect cost of the application of this measure is not particularly important, as the following requirements must first be fulfilled: (a) preparation of terms for receiving tenders, (b) evaluation of the offers by technical and financial criteria.

Measure implementation period: 2014-2016

Estimated Energy Saving: 40.000 kWh/year

Estimated Emission Reduction: 23.000 kg. CO_2/year

Estimated Insulation Cost: 15.000 €

Estimated Saving: 7.000 €

Measure ENEF 2 – Bulbs replacement

The indirect application cost of this measure is not particularly important as lamps purchase and replacement is required by technical and financial criteria.

Measure implementation period: 2012

Estimated Energy Saving: 3.000 kWh/year

Estimated Emission Reduction: 2.600 kg. CO_2/year

Estimated Insulation Cost: 1.000 €

Estimated Saving: 600 €

Measure ENEF 3 – Maintenance of air conditioning systems

The indirect application cost is considered small as it includes the maintenance equipment and the required spare parts for the air conditioning systems. It is required to attribute responsibilities to the technical staff of the municipality regarding the maintenance of heating and air conditioning of municipal buildings, every 6 months.

Measure implementation period: 2012 - 2020

Estimated Energy Saving: 20.000 kWh/έτος

Estimated Emission Reduction: 11.500 kg. CO_2/έτος

Estimated Insulation Cost: 6.000 €

Estimated Saving: 3500 €

7.3 Energy Saving through awareness raising campaigns

Measure ESAC1: Organization of an annual seminar on Renewable Energy Sources

The organization of an annual seminar on Renewable Energy Sources (RES) in Pano Lefkara Municipality was examined. The all-day seminar will be held at the Cultural Center, annually for a total of 3 years.

The indirect cost for the application of this measure can be considered high as apart from the organization of the seminar (speakers, invitations, space, catering etc), interested parties will have to bear the costs of implementing RES at home on their own.

Measure implementation period: 2012 - 2014

Measure Code	**ESAC 1**	
Measure Name	Organization of an annual seminar on Renewable Energy Sources	
APPLICATION COST		
Cost of Measure	**1.500 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Green Energy €/year) Environmental (kg CO_2-eq)	**36.000 kWh/year** The financial benefits for interested parties **31.565 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.05€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 100*3*0.3*3*1000kWh/year= 270.000 kWh/year

Measure ESAC2: Organization of annual seminar on Energy Saving

The organization of an annual seminar on Energy Saving in Pano Lefkara Municipality was examined. The all-day seminar will be held at the Cultural Center, annually for a total of 3 years.

The indirect cost for the application of this measure can be considered high as apart from the organization of the seminar (speakers, invitations, space, catering etc), interested parties will have to bear the costs of implementing energy saving technologies at home on their own.

Measure implementation period: 2012 - 2014

Measure Code	**ESAC 2**	
Measure Name	**Organization of annual seminar on Energy Saving**	
APPLICATION COST		
Cost of Measure	**1.500 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**21.00 kWh/year** The financial benefits for interested parties **14.892 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.10€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 100*3*0.25*3*700kWh/year= 157.500 kWh/year

Measure ESAC3: Organization of educational presentations to students

The organization of educational presentations to students on renewable energy sources and energy saving was examined. The measure includes a set of six (6) presentations.

The indirect cost of the measure can be considered as high as apart from the organization of the presentations, the interested party (who will become aware of the measure through their children) should bear the costs of implementing energy saving measures or renewable energy sources in their home, on their own.

Measure implementation period: 2010-2020

Measure Code	**ESAC 3**	
Measure Name	**Organization of educational presentations to students**	
APPLICATION COST		
Cost of Measure	**1.800 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**108.000kWh/year** The financial benefits for interested parties **76.589 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.02€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 350*6*0.4*3*800kWh/year= 2.016.000 kWh/year

Measure ESAC4: Organization of "Day without lighting"

The organization of an annual day without lighting in Pano Lefkara Municipality was examined. The measure will apply for a period of 8 years.

The indirect cost of the measure application can be considered as high as, apart from the event organization, the interested party should bear their own costs of implementing energy saving measures or renewable energy sources at home.

Implementation on 30 March 2012

Measure Code	**ESAC 4**	
Measure Name	**Organization of "Day without lighting"**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**9.600 kWh/year** The financial benefits for interested parties **6.808 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.44€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 5000*10*0.20*3*120kWh/year= 3.600.000 kWh/year

Measure ESAC5: Energy Information in the Municipality website and newspaper

The posting of information on Renewable Energy Sources (RES) and Energy Saving (ES) in the Municipality of Pano Lefkara website was examined. In addition, there will be a special article on energy in the Municipality quarterly magazine. The measure will apply for a period of 8 years.

The indirect cost of the measure application can be considered as high as the interested party should bear the costs of implementing energy saving measures or renewable energy sources at home, on their own.

Start of Implementation: 2012

Measure Code	**ESAC 5**	
Measure Name	**Energy Information in the Municipality website and newspaper**	
APPLICATION COST		
Cost of Measure	**0 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**45.000 kWh/year** The financial benefits for interested parties **31.912 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.00 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 2000*10*0.15*3*455kWh/year= 4.500.000 kWh/year

Measure ESAC6: Free consulting services to the citizens from Municipal Officers

The possibility of providing free consulting services to the citizens from Municipal Officers was examined. The measure will apply for 7 years.

The indirect cost of the measure application can be considered as high as the interested party should bear the costs of implementing energy saving measures or renewable energy sources at home, on their own. The number of people interested in this service will be relatively smaller than the number of participations in other events.

Start of Implementation: 2013

Measure Code	**ESAC 6**	
Measure Name	**Free consulting services to the citizens from Municipal Officers**	
APPLICATION COST		
Cost of Measure	**0 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**283.500 kWh/year** The financial benefits for interested parties **201.047 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.00 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 255*3*0.75*3*1800kWh/year= 3.098.250 kWh/year

Measure ESAC7: Organization of "Cycling Day"

The organization of an annual "Cycling Day" in Pano Lefkara Municipality was examined. The measure will apply for 8 years.

The indirect application cost of this measured is considered to be low as apart from the organization of the event, the participants will not be burdened with further costs.

Start of Implementation: September 2012

Measure Code	**ESAC 7**	
Measure Name	**Organization of "Cycling Day"**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**110.520 kWh/year** The financial benefits for interested parties in terms of fuel saving **78.377 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.04€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 180*10*0.2*3*921kWh/year= 994.680 kWh/year

Measure ESAC8: Informational leaflets and messages

The preparation of information material to be used for updating, information and public awareness was examined.

The indirect application cost of this measure can be considered high, as apart from the preparation and distribution of informational material the interested party should bear their own cost for any investment or saving they proceed to.

Measure Implementation Period: June 2012-2020

Measure Code	**ESAC 8**			
Measure Name	**Informational leaflets and messages**			
APPLICATION COST				
Measure Cost	**Total (€)**			
(a) Leaflets on RES and ES	**1.500 €**			
(b) Leaflets on sustainable mobility	**1.500 €**			
Indirect Cost				
	☒ **– High** ☐ **– Average** ☐ **– Low**			
APPLICATION BENEFITS				
Energy	Number/ receivers	Awareness Percentage	Energy Benefit (kWh/person.year)	**Energy Saving (kWh/year)**
(a) Leaflets on RES and ES	300	5%	1100	**16.500**
(b) Leaflets on sustainable mobility	300	5%	2210	**33.156**
Financial				
	The financial benefits for interested parties in terms of energy saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
(a) Leaflets on RES and ES	11.701			
(b) Leaflets on sustainable mobility	8.375			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**	
(a) Leaflets on RES and ES	**0.13 €/ kg_{CO2} annual saving**		☒	
(b) Leaflets on sustainable mobility	**0.18 €/ kg_{CO2} annual saving**		☒	
DELIVERABLE				
Total Cost **3.000 €**		**Emission Reduction** **20.076 Kg_{CO2}/ year**		

7.4 Energy Saving in Transport

Measure EST1: Promotion of vehicles with low CO_2 emissions

The possibility of purchasing to vehicles with low CO_2 was examined.

The indirect application cost of the measure can be considered low since interested parties (to be aware of the eco-car market) would bear the cost of purchase on their own.

The indirect application cost of the measure is not particularly important, as the following requirements must first be fulfilled: (a) preparation of the call for tenders (b) Evaluation of offers by specific technical and financial criteria (c) completion of form (application) to ensure the subsidy from the 2009-2013 Grant Schemes of the Ministry of Commerce, Industry and Tourism.

The purchase of low emissions vehicles is sponsored by the Scheme of the Ministry of Commerce, Industry and Tourism. 700 € for low emissions vehicle and 1200€ for a hybrid.

Measure Implementation Period: 2014 – 2018

Measure Code	**EST1**	
Measure Name	**Promotion of vehicles with low CO_2 emissions**	
APPLICATION COST		
Cost of measure	**Total (€)**	
Purchase of 2 eco-cars	**35.000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy	**Energy Saving (kWh/year)**	
Purchase of 2 eco-cars	**18.420**	
Financial	**Saving (€/year)**	
Purchase of 2 eco-cars	**2000**	
Environmental	**Emissions saving (kg_{CO2}/ year)**	
Purchase of 2 eco-cars	**4.653**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for implementation**
Purchase of 2 eco-cars	**7.52 €/ $kg_{CO2\ annual\ saving}$**	☒
DELIVERABLE		
Total Cost **35.000 €**	**Emissions Reduction** **4.653 Kg_{CO2}/ year**	

Measure EST2: Energy Saving in Transport by Upgrading the Cycle Path Network in Pano Lefkara

The upgrade of the cycle path network in Pano Lefkara aiming to promote bicycle use was examined.

The indirect application costs is considered low.

Start of Implementation: 2015 (for 6 years)

Measure Code	**EST 4**			
Measure Name	**Upgrade of Cycle Path Network**			
APPLICATION COST				
Cost of measure	**Ολικό (€)**			
Upgrade of Cycle Path Network	**25.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	New Cycle Paths (km)	Traffic per Year (Number of routes)	ES per Km + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
Upgrade of Cycle Path Network	4	1.500	20	**120.000**
Financial				
	The financial benefits for interested parties from fuel saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
Upgrade of Cycle Path Network	**30.312**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for implementation**	
Upgrade of Cycle Path Network	**0.82€/ $kg_{CO2\ annual\ saving}$**		☒	
DELIVERABLE				
Total Cost 25.000 €		**Emissions Reduction 30.312 Kg_{CO2}/ year**		

7.5 Energy Saving in Street Lighting

Measure ESSL1: Energy Saving in Street Lighting

The possibility of energy saving in street lighting was examined. Street lighting is one of the major expenses of the Municipality. The electricity consumption for street lighting in Pano Lefkara Municipality in 2009 was 134.000 kWh.

A case was examined: (a) replacement of current lamps with economic LED lamps.

The indirect application cost can be considered low.

Year of Measure Implementation: 2014

Measure Code	**ESSL 1**			
Measure Name	**Energy Saving in Street Lighting**			
APPLICATION COST				
Cost of measure	**Total (€)**			
(a) Replacement of current lamps with economic LED lamps	**22.500 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
Maintenance Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	Number	Electricity consumption per lamp (kWh/year)	ES per lamp per year (%)	**Energy Saving (kWh/year)**
(a) Replacement of current lamps with economic LED lamps	150	800	50	**72.000**
Financial	Energy Saving (kWh/year)	Average Electricity Price (€/kWh)		**Saving (€/year)**
(a) Replacement of current lamps with economic LED lamps	72.000	0.18		**12.960**
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
(a) Replacement of current lamps with economic LED lamps	**62.928**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for implementation**	
(a) Replacement of current lamps with economic LED lamps	**0.36 €/ $kg_{CO2\ annual\ saving}$**		☒	
DELIVERABLE				
Total Cost **22.500 €**	**Saving** **12.960 €**	**Emissions Reduction** **62.928 Kg_{CO2}/ year**	**Depreciation** **1.74 years**	

7.6 Investments of Pano Lefkara Municipality in RES

Measure RES1: Renewable Electricity with Photovoltaic Systems

The creation of a Photovoltaic Park was examined.

The indirect application cost is not particularly important as the following requirements must first be fulfilled: (a) preparation of the call for tenders (b) Evaluation of offers by specific technical and financial criteria (c) completion of form (application) to ensure the subsidy from the 2009-2013 Grant Schemes of the Ministry of Commerce, Industry and Tourism. Additionally, the process of connecting the Photovoltaic Park with the electricity network grid of EAC should be performed. Photovoltaic Systems (Parks) receive a subsidy on the sold kWh (selling price is €0,28)

Measure Implementation Period: 2016

Measure Code	**RES 1**			
Measure Name	**Renewable Electricity with Photovoltaic Systems**			
APPLICATION COST				
Investment Cost	**Total (€)**			
Photovoltaic System 20 kW	**60.000**			
Operational Cost				
Photovoltaic System 20 kW	**0 € (negligible cost for the periodical cleaning of the frames)**			
Indirect Cost				
	☐ **– High** ☒ **– Average** ☐ **– Low**			
APPLICATION BENEFITS				
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	**Green Energy (kWh/year)**	
Photovoltaic System 20 kW	20	1500	**60.000**	
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	**Income (€/year)**	
Photovoltaic System 20 kW	60.000	0.28	**16.800**	
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
Photovoltaic System 20 kW	**52.440**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**		
Photovoltaic System 20 kW	**1,14 €/ $kg_{CO2\ annual\ saving}$**	☒		
DELIVERABLE				
Total Cost 60.000 €	**Income 16.800 €**	**Emission Reduction 52.440 Kg_{CO2}/ year**	**Depreciation 4 years**	

7.7 Development of Green Spaces in Pano Lefkara Municpality

Measure DGS1: Development of green spaces

Regarding the development of green spaces in Pano Lefkara Municipality, two cases were examined: (a) planting of trees and (b) care of green spaces.

The indirect application cost can be considered low.

Measure Code	**DGS 1**	
Measure Name	**Development of green spaces**	
APPLICATION COST		
Cost of measure	**Total (€)**	
(a) Planting of trees (200 trees)	**500 €**	
(b) Care of Green Spaces	**1.000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Environmental	**Emissions Saving (kg_{CO2}/ year)**	
(a) Planting of trees (200 trees)	**6.000**	
(b) Care of Green Spaces	**3.000**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
(a) Planting of trees (200 trees)	**0.08 €/ $kg_{CO2\ annual\ saving}$**	☒
(b) Care of Green Spaces	**0.33 €/ $kg_{CO2\ annual\ saving}$**	☒
DELIVERABLE		
Total Cost **1500 €**	**Emission Reduction** **9.000 Kg_{CO2}/ year**	

7.8 Summary of measures of Pano Lefkara Municipality

Trade 20 Brief Presentation of Measures Taken by Pano Lefkara Municipality and Included in the Sustainable Energy Action Plan

Measure/ Action	Application	Cost (€)	Emissions Reduction (Kg_{CO2}/ year)	Depreciation (years)
Energy Saving in Public Buildings				
ENEF 1: Insulation Interventions	2014-2016	55.000	15.000	2 years
ENEF 2: Lamps Replacement	2012	800	2.600	1,2 years
ENEF3: Maintenance of Air Conditioning Systems	2012-2020	2.000	7.300	0,8 years
Energy Saving through Awareness Raising Campaigns				
ESAC1: Organization of an annual seminar on Renewable Energy Sources	2012-2014	1.500	31.565	-
ESAC2: Organization of an annual seminar on Energy Saving	2012-2014	1.500	14.892	-
ESAC3: Organization of educational presentations to students	2010-2020	1.800	76.589	-
ESAC4: Organization of "Day without lighting"	2012-2020	3.000	6.808	-
ESAC5: Information about energy in the Municipality website and newspaper	2010-2020	0	31.912	-
ESAC6: Free consulting services to citizens from Municipal Officers	2013-2020	0	201.047	-
ESAC7: Organization of "Cycling Day"	2012-2020	3.000	78.377	-
ESAC8: Raising awareness through informational leaflets and messages	2012-2020	3.000	20.076	-
Energy Saving in Transports				
EST1: Energy saving in the Municipality's fleet	2014-2018	35.000	4.653	-
EST2: Energy Saving in Transport by Upgrading the Cycle Path Network in Pano Lefkara	20150	25.000	30.312	-
Energy Saving in Street Lighting				
ESSL1: Energy saving in street lighting	2015	22.500	62.928	1.74 years
Investments of Pano Lefkara Municipality in RES				
RES1: Investments of Pano Lefkara	2016	60.000	52.440	4 years

Municipality in renewable electricity (solar)				
Development of Green Spaces in Pano Lefkara Municipality				
DGS1: Development of Green Spaces	2012-2020	1.500	9.000	-
TOTAL		**215.600**	**645.499**	

7.9 Contribution of National Measures on the Sustainable Energy Action Plan of Pano Lefkara Municipality

Energy saving and carbon dioxide emissions reduction for 2020 from the contribution of national measures, were calculated and are presented in the tables below.

Trade 21 Brief Presentation of Energy Saving from National Measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Energy Saving (MWh/year)			
		Residential	Tertiary	Industry	Transports
1	Legislation on Energy Building Performance (Equation 1)	54	66	3	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	26	32	1	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	3	3	0	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	6	8	0	0
5	Legislation on energy efficiency of appliances (Equation 1)	38	61	3	0
6	Grant Schemes for the installation of Photovoltaic Systems (Equation 2)	7	6	11	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	5	7	0	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	66	1	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	7	0
10	Plan of single urban transport system (Equation 3)	0	0	0	827
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	861
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	207
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	110
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	138
	TOTAL PER SECTOR	138	249	28	2.142
	GRAND TOTAL	2.557			

Trade 22 Brief Presentation of CO_2 Emissions Reduction from National Measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Emissions Reduction (t CO_2/year)			
		Residential	Tertiary	Industry	Transports
1	Legislation on Energy Building Performance (Equation 1)	38	49	2	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	18	23	1	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	2	2	0	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	5	6	0	0
5	Legislation on energy efficiency of appliances (Equation 1)	27	45	2	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	5	4	8	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	3	5	0	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	49	1	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	5	0
10	Plan of single urban transport system (Equation 3)	0	0	0	209
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	218
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	52
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	28
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	35
	TOTAL PER SECTOR	98	183	20	541
	GRAND TOTAL	842			

Trade 23 Equations Used for the Estimation of the Contribution of the National Measures to Energy Saving

(1) ES=EC*np*nc*ns
ES: Energy Saving (MWh) EC: Energy Consumption (MWh) np: Number of Participation (0-100%) nc: Consumption rate per consumption category (0-100%) ns: Saving Percentage by applied measure (0-100%)

(2) GE=N*P*np
GE: Green Energy (MWh) N: Population P: Production per application (MWh) np: Participation percentage (rate) (0-100%)

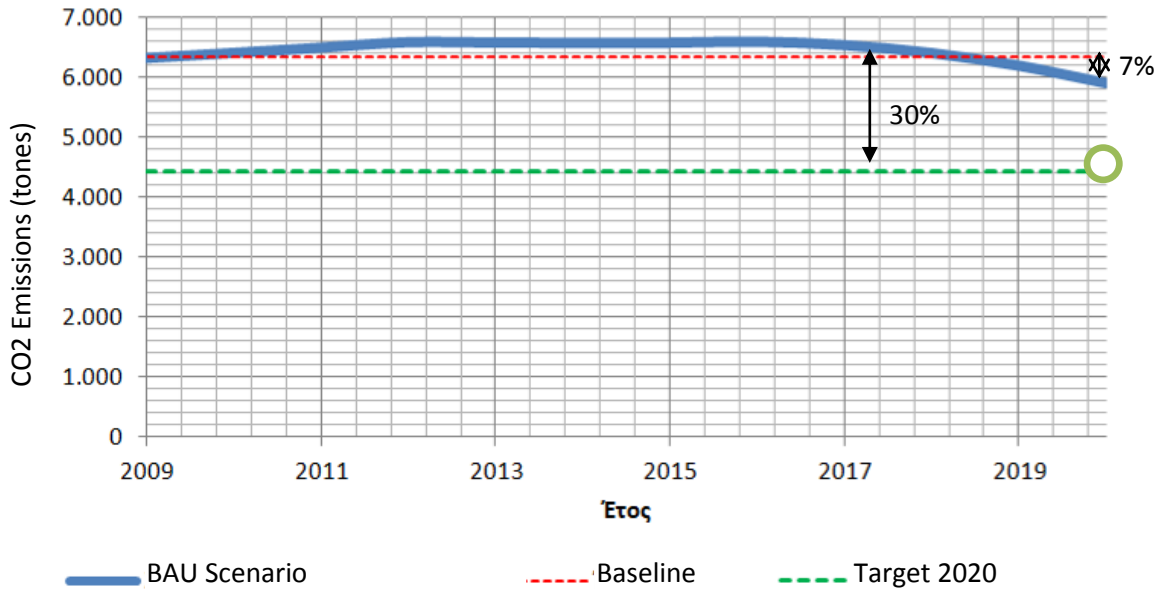
(3) EOS=(N*FO*np)+(ΔO*FO*np)
EOS: Energy Saving in terms of Fuel (MWh) N: Population FO: Fuel Saving per person (MWh) np: Participation percentage (rate) (0-100%) ΔO: Passing Vehicles

7.10 Description of Achieving CO2 Emission Reduction for 2020

The overall goal of reducing carbon dioxide emissions achieved by implementing the action plan for 2020 is a 30% reduction compared to the reference year 2009. The achievement of this objective is presented in the table below.

Emission inventory for reference year 2009 (tn CO_2/year)	6.339
Expected emissions for 2020 – Expected Development Scenario (tn CO_2/year)	5.915
Estimated emission reduction from national measures for 2020 (tn CO_2/year)	842
Estimated emission reduction by the Municipality for 2020 (tn CO_2/year)	645
Total estimated emission reduction for 2020 (tn CO_2/year)	1.487
Estimated emissions for 2020 through the application of the Action Plan (tn CO_2/year)	4.428
Emission reduction percentage by 2020 compared with 2009	**30%**

Figure 25 Schematic of the Expected Evolution Scenario of CO2 Emissions in Paralimni Municipality and the Reduction Target for 2020 by 30%



Sources of energy data

- Consumption of fuels and heating fuels from oil companies within the administrative limits of Pano Lefkara Municipality.

- LPG consumption from the Statistical Service of Cyprus (Reduction at local level based on the population) [www.mof.gov.cy/cysta*]*

- Annual growth rates from the Statistical Service of Cyprus and estimates of scholars [www.mof.gov.cy/cysta*]*

- National Action Plan for reducing CO_2 emissions from the Department of Environment [http://www.cyprus.gov.cy/moa/agriculture.nsf]

- National Action Plans for the share of RES from the Energy Service. [http://www.mcit.gov.cy/mcit/mcit.nsf]

- National Action Plans for Energy Saving at end-use from the Energy Service. [http://www.mcit.gov.cy/mcit/mcit.nsf]

- Grant Schemes for RES and ES from the Energy Service

[http://www.mcit.gov.cy/mcit/mcit.nsf]

- Development of Public Transport Plans from the Department of Road Transport [www.mcw.gov.cy/mcw/rtd/rtd.nsf*]*

- Electricity Consumption data in the Municipality of Pano Lefkara from the Electricity Authority of Cyprus [www.eac.com.cy*]*

- Energy consumption data in municipal buildings in Pano Lefkara

- Information concerning the installation of more efficient electricity generators (combined cycle) from EAC [www.eac.com.cy*]*

- Information about the advent of Natural Gas from the Energy Service [http://www.mcit.gov.cy/mcit/mcit.nsf]

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