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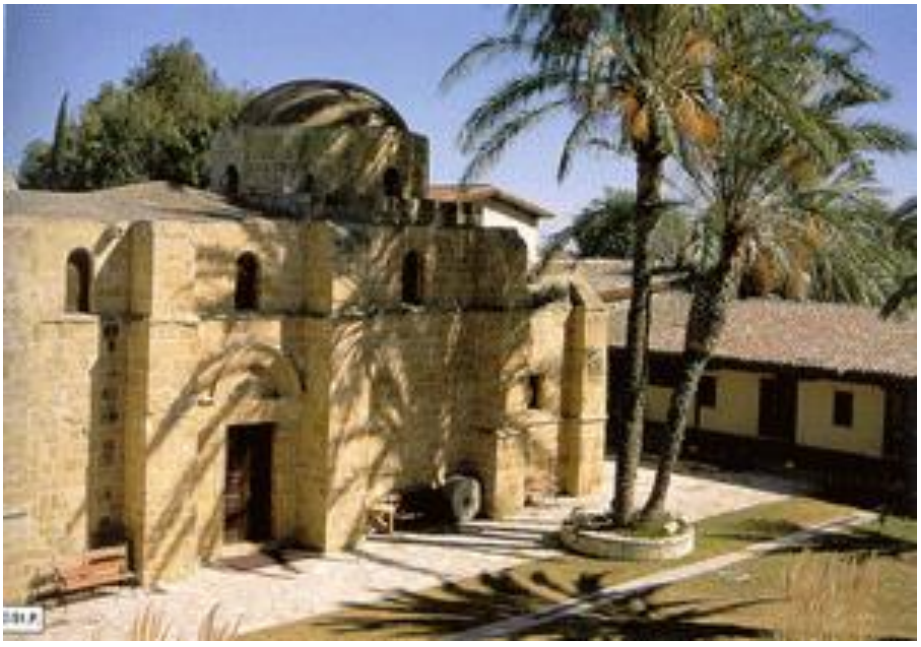
PACT OF ISLANDS

Sustainable Energy Action Plan

Lakatamia Municipality - Cyprus



5 September 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 Lakatamia Municipality.

The Lakatamia is today one of the seven major municipalities of Nicosia with a population of approximately 40,000 residents and an area of 29 square kilometers.

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 Larnaka was 598.151 MWh The largest consumer of energy in the municipality is transport with 375.210 followed by the residential sector with 119.394 MWh and less with the tertiary sector 75.273 MWh.

The CO_2 emissions in 2009 attributable to the overall energy consumption in the municipality are 215.611 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 225.591 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	5
Energy Saving via informational campaigns	9
Energy saving in transport	4
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 13.994 tons. In addition, it was estimated that the impact on Lakatamia Municipality from the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 44.333 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 58.327 tons annual emissions for 2020 will be limited to 167.264 tons. That is, **22,4%** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2011 to 2020 amounts to € 1.488.500. 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.

Contents

Tables

Figures

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.

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	**Latsia Municipality**
Agios Athanasios Municipality	**Paralimni Municipality**
Lakatamia Municipality	**Engkomi Municipality**
Aglantzia Municipality	**Geri Municipality**
Larnaca Municipality	**Ergates Community**
Aradippou Municipality	**Psimolofou Community**
Polis Chrysochous Municipality	**Lefkata 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)

Figure 3 The Mayor of Agios Athanasios Kyriakos Chadjittofis (left) and the Mayor of Aglantzia Andreas Petrou (right)

Figure 4 The Mayor of Aradippou Christakis Liperis (left) and the Mayor of Idalion Leontios Kallenos (right)

Figure 5 The Mayor of Lakatamia Loukas Iatrou (left) and the Mayor of Larnaca Andreas Moyseos (right)

Figure 6 The Secretary of Latsia Municipality Michalis Sokratous (left) and the Mayor of Paralimni Andreas Evaggelou (right)

Figure 7 The Mayor of Polis Chrysochous Aggelos Georgiou (left) and the Mayor of Strovolos Savvas Iliofotou (right)

Figure 8 The Secretary of Ergates Community Kyriakos Christodoulou (left) and the President of Geri Community (Municipality) Argyris Argyrou (right)

Figure 9 The President of Psimolofou Community Ioannis Lazarides

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.

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. LAKATAMIA MUNICIPALITY

3.1. Introduction

Lakatamia today is one of the seven major municipalities of Nicosia with a population of approximately 40,000. By 1979 Lakatamia was the the Village Authority and from 1979-1986 was Improvement Board. Was declared municipality in the February 23, 1986 following a referendum in which 86% of the city's residents were given a positive vote. The municipal boundaries of Lakatamia established with the proclamation of a municipality. Today Lakatamia has a population about 40,000 residents and an area of 29 square kilometers. The Lakatamia bordered by the municipalities of Strovolos, Latsia and Engomi, Tseri, Deftera, Agious Trimithias and Paliometoho.

3.2. History

There are no archaeological evidence from ancient texts or other sources to substantiate the existence of an ancient city on the site of today Lakatamia.

But it is very likely that there were agricultural settlements, as is proved, from medieval times onwards whose inhabitants cultivated the fertile land of the area and supplied Nicosia with agricultural and livestock products.

The earliest written reference to Lakatamia contained in the "Chronicle George Voustronios 1456-1489 AD", who writes that Lakatamia belonged to Count of Tripoli Peter Lusignan who in 1436 baptize the Charlotte daughter of the nephew of King John "and he gave to her the city of Lakatamia'.

Until the occupation of Cyprus by the Turks (1571), the population of Lakatamia was purely Greek except the Franks and later the Venetian nobles, who held the fiefs of the region.

The descent of the Turks marked the end of the presence of both the Venetians as general and Latin, but also the beginning of the presence of the Turks in Lakatamia. There appears, however, has never been a large number of Turks in Lakatamia. first census during the British in 1881, recorded 17 residents in the manor of Koulouratou (manor of Aga), 355 in the Kato Lakatamia and 244 in Pano Lakatamia . During the second survey, in 1891, the manor incorporated in Kato Lakatamia where recorded 414 residents, of whom 361 Greeks and 53 Turks.

During the first intercommunal troubles of 1957-1958, which had been instigated by the British government as a measure to address the Cyprus liberation movement, the Turks fled Lakatamia and settled in Nicosia. Many kept their land and retain legal ownership to date.

3.2.1. Independence - Invasion

Like the whole of Cyprus, so the Lakatamia particular, began to grow at a fast pace since the independence of Cyprus (1960) onwards. The Turkish invasion of 1974 brought a complete reversal of the landscape in Lakatamia, with a population explosion of the population grew tenfold in two decades turning from a community of 5,000 residents just before the invasion, in a town of 40,000 inhabitants in the early years of the 21st century. Lakatamia, located on the outer perimeter of the Greater Nicosia and relatively safe distance from the confrontation line, received a large influx of refugees from all occupied territories both in government settlements and refugee in private homes.

Lakatamia also received a relatively large number of Maronites refugees from the villages Kormakitis, Asomatos, Agia Marina Skyllouras and Karpashia. Today the Maronite community of Lakatamia numbers about 800 people. About half are located in the parish Anthoupolis where the church of St. Maron and the Maronite elementary school.

Today the refugees are more than 65% of the total population of the city without taking into account the more than 4000 refugees from the Settlement Anthoupolis which is not subject to administrative Lakatamia municipality but directly to the central government.

Moreover, given the large number of metics from deforested highlands, it is understood the mosaic of people today make up the city of Lakatamia.

3.3. Local Plan of Nicosia

By 1990 the control of development in Cyprus, based on Public Roads and Building Law and Regulations. That legislation did not provide sufficient opportunities for effective control aspects of urban development, neither the means to allow the pursuit of locational policy or indirect interference in the workings of the land market. The role of the public sector was essentially regulatory and somewhat negative in character, and there was a possibility only in response to private sector initiatives.

Given the strong growth of development pressures caused by natural population growth, urbanization and the growth of industry, commerce, tourism and services, the Cyprus State decided to introduce planning and zoning law, so as to ensure rationalization of physical development. For this reason it was voted Urban and Regional Planning Law of 1972 and subsequent amendments, and came into full operation for the first time on December 1, 1990.

The Nicosia Local Plan prepared in accordance with the relevant provisions of the Urban and Regional Planning Law and launched by the Nicosia Master Plan , prepared by the Government in collaboration with the Municipality of Nicosia and Development Programme of the United Nations (UNDP). To Nicosia Local Plan was published for the first time on December 1, 1990. The first amendment of the Local Plan was published on October 4, 1996, and the Plan was finalized after consideration of the objections, which was completed and published in two phases (1999 and 2000). In the study of this amendment, consultations with the Joint Council Committee established pursuant to the provisions of Article 12 (1) of the Urban and Regional Planning Law

In Nicosia Local Plan specifying general principles upon which will be promoted, monitored and regulated development in the Local Plan. It is expected that the application of the provisions of the Plan will be achieved gradually balanced urban development and consolidation of the wider area of Nicosia.

In Local Plan areas include the municipalities of Nicosia, Ayios Dometios ,Engomis, Strovolos, Aglantzia ,Lakatamia and Latsia and the area of the Community Council of Geri, as shown in Figure 4 Study Area and Administrative Structure. The extent of the area of the Local Plan is 19,000 hectares, according to the report of Statistics Census of Population (October 2001) - Population Data by District, Municipality and Community in October 2001 had a population of 198,200 people.

[Source: Nicosia Local Plan]

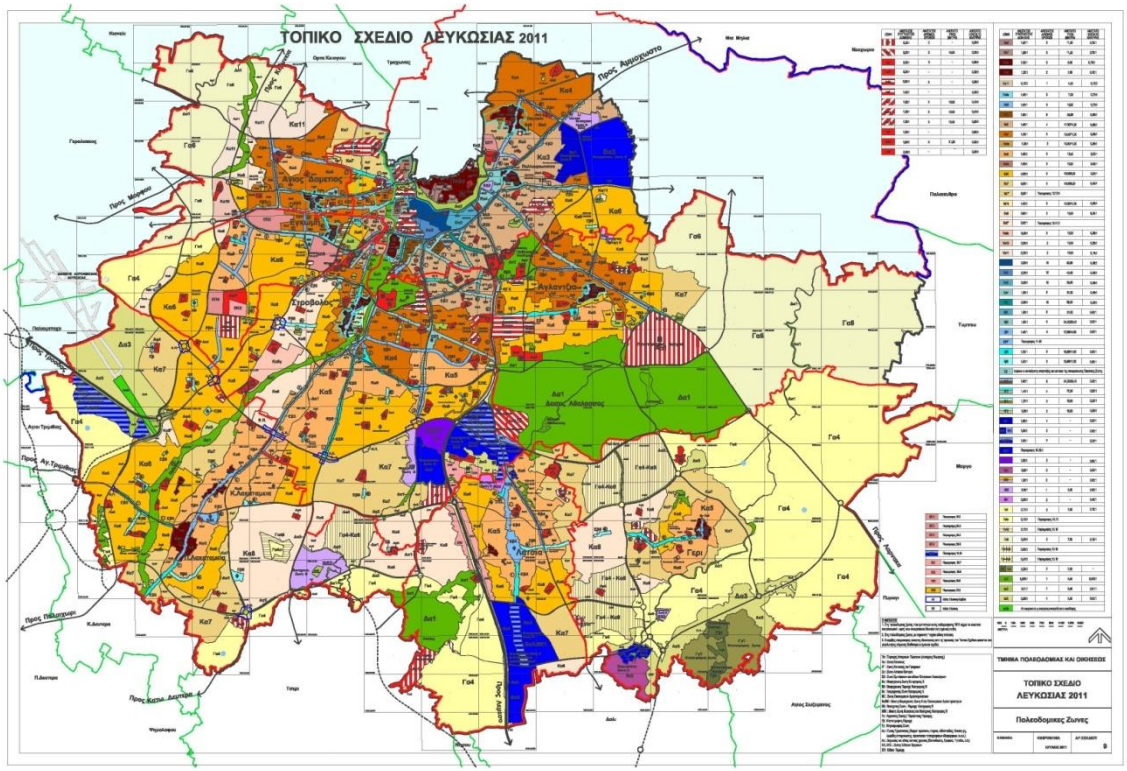


Figure 10 Nicosia Local Plan

3.4. Local Plan Key Objectives

The Nicosia Local Plan is to define and implement the appropriate term planning policy framework that will allow the rational development of Nicosia until 2012, which is defined as the horizon year of this Local Plan.
In the study of this amendment to the Local Plan of Nicosia, the main targets set in the original publication of the Plan were reassessed and confirmed that they are the best choice for the gradual reorganization and planning of urban development. These objectives, enriched with modern town planning concepts, are summarized as follows:

(a) The rational allocation of land uses in a way that ensures the best financial and functional organization of the city, separating as far as possible, incompatible uses, to protect the quality of life of the population, and to ensure a balanced variety compatible uses where this is desirable.

(b) The conservation of natural resources and the natural environment of the Local Plan, for the benefit of current and future urban population, according to the principles of sustainable development.
(c) Ensuring the planning and operational capabilities reunification of Nicosia after removing the Dead Zone, and to preserve the functioning of the broader perspective of Nicosia as a single, undivided city.

(d) Upgrading of the organization and therefore the operation of the wider urban complex Nicosia as a unified whole town.

(e) The adoption of feasible solutions in relation to the current situation, and its application within the above framework, flexible and resilient policy measures which enable future changes and adapt to unexpected changes, if necessary by prevailing conditions.

(f) Ensuring the beneficial and efficient use of land 12 stocks available in areas designated for development, services and network infrastructure provided by the public sector (public schools across grades, road networks, water supply networks, telecommunications, electricity , drains, etc.).

(g) The gradual upgrading of amenities, quality of life and level of service of the entire urban population.

(h) The safeguarding and promotion of organized and integrated urban development through the application package provisions and incentives to encourage adoption of the designated growth areas.

(i) Ensuring the conditions for upgrading the Regional Growth Poles in substantial concentration of future physical development and, by extension, social and economic activity.

(j) The rationalization of residential areas so as to obtain the functional interrelationship of the distribution of the population with employment opportunities and services.

(k) The creation of conditions for the implementation of residential developments to meet the needs and capabilities of all income groups of population growth areas within the Local Plan, both through public and private sector, and to encourage single integrated design of residential developments.

(l) The adoption of measures that will contribute to a gradual but radical solution of operational or other problems encountered in sub-urban areas.

(m) The application of modern multidimensional traffic policy aimed balanced current and future operational needs of the entire city and all income groups of the population.

(n) The implementation of policy measures will help to protect and enhance the crucial role played by the Urban Center as the operational center of the whole of Nicosia, the wider region, but also of the whole of Cyprus.

(o) The equitable distribution of commercial activities and uses at strategic points in the urban fabric and prioritization of local commercial cores based on the population they serve.

(p) The preservation of data and areas of special or outstanding natural, historical, cultural and architectural interest. Specifically, the program seeks to adopt protection, preservation, restoration and revitalization of the walled town and other historical core, so that these areas be upgraded into attractive residential areas, business and cultural activities.

(q) The protection and gradual improvement of the natural environment of the area of the Local Plan, as this is a crucial factor for ensuring the quality of life and balance of uses and ecosystems.

(r) Enhancing opportunities for recreation and entertainment of the entire urban population, and the development and enrichment appropriate existing green spaces and ensuring young people for establishing an integrated and hierarchical system of free spaces.

3.5. General Development Strategy

To achieve these goals, after evaluation of various alternatives chosen in 1990 and continues to adopt the following General Development Strategy and the individual provisions urban policy. Guiding principle of this Strategy will be assessed and confirmed in the present amendment of the Plan is the use of resources so that it could continue to produce and available for future generations, as well as effective organization and consolidation of development. The General Development Strategy of the Local Plan is based on the principle of organized and integrated development of the wider Nicosia and is crucial for the quality of the urban environment. The strategy is mainly based on the concept of sustainable development, combined with its stated policy to discourage the proliferation of various types of development in areas other than those specified, consistent with the goals and philosophy promoted by the European Union regarding the organization urban complexes. The General Development Strategy is the backbone of the Local Plan in Nicosia and is seated individual policy provisions mentioned specialized in different areas of development (eg, residential and commercial development).

[Source: Nicosia Local Plan]

Figure 11 Lakatamia Town Hall

Figure 12 Monument of those killed and missing of Lakatamia (Gr.Afxentiou)

Figure 13 Municipal Swimming Pool

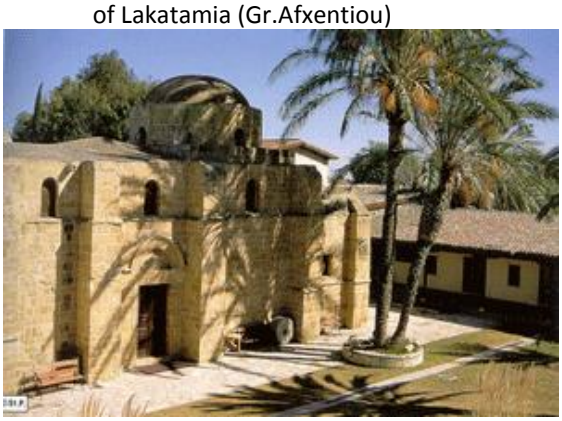


Figure 14 Church Arch. Michael in Archaggelos

Figure 15 Auditorium of Lakatamia

Figure 16 Pedieos Cycle and Pedestrian Path

Figure 17 Pedieos River

Figure 18 Maggli Lake

Figure 19 Bridge in Pedieos River

Figure 20 Park of Freedom and Peace

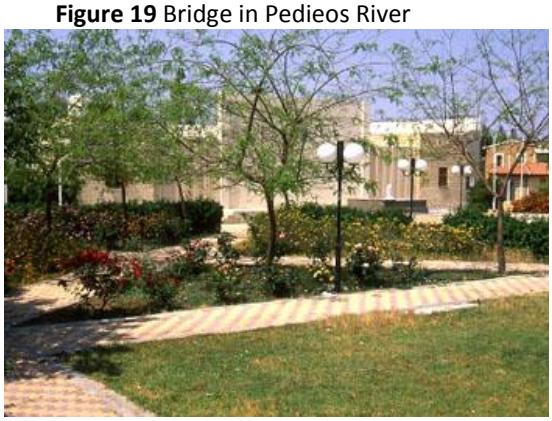


Figure 21 Agios Georgios Park

Figure 22 Agios Nikolaos church

Figure 23 Lakatamia Health Center
[Source: http://www.lakatamia.org.cy]

Figure 24 Multifunctional Center of Lakatamia

3.6. Environmental Policy – Green Space Development

A special place among the existing parks in the municipality of Lakatamia hold except the Linear Park Pedieos River, Park of St George, Park Alexandrou Panagouli and Kefallinias Park. Over in this great ecological zone of Lakatamia plans new projects that will expand quality green spaces, so as to form spaces and social intercourse.

Parks and green spaces located within the municipal limits of the municipality of Lakatamia included a four-year design and landscaping plan prepared by the Municipality, as part of broader effort to upgrade the quality of Nicosia.

Under the four-year plan (2008-2011) adopted of Lakatamia for complete design and landscaping of green spaces and parks, are scheduled as follows:

(A) The already partially shaped spaces such as:

1. Park of Freedom and Peace (former DEXEL) – Charalampides area

2. Park Achaion- Archaggelos area opposite from Z΄ Elementary school and

3. Park Anthoupolis (Anthousis & Galatias)

has decided to be upgraded, including the area of the park restaurant / cafeteria and their upgrading will be given to a private investor.

(B) The following sites have been selected for full recovery / landscaping from the municipality:

1. Riga Fereou street (Koulouratos area)
2. Kleonos street (Archaggelos area)
3. Argaki of Mantissas (from Agiou Stylianou until Aneksartisias)
4. Roundabout in Dias street
5. Agios Georgios Park (completion)
6. G. Kranidioti Park (Archaggelos area)
7. Linear Park of Pedieos alongside of the routes Sporades / Aegean in Anthoupoli
8. Kallithea street: center Tsantali in Pano Lakatamia
9. Stelmek area: central big area

10. Myrtou street : Kato Lakatamia area
11. Evrou street: Pano Lakatamia area/near Pefkou
12. Kallipoleos street: Kato Lakatamia area behind from Farma
13. Oikopeda Archiepiskopis street behind the American radiostation
14. Kalogreas street: Kato Lakatamia area to Strovolos
15. Ymittou street: Anthoupoli area west from intercity of Nicosia-Palaichori
16. Kefallinias street: Anthoupoli area near to the Outpatient Clinic
17. Linear Park Pedieos alongside of Andriani street, opposite from the Municipal warehouses
18. Olga street: Konnovaros-Anthoupoli area
19. Katokopias street : Kato Lakatamia area to Ippocratous street.
20. Gravias street: Borders of Engomi/Lakatamia

Γ) Regarding the playgrounds located in green areas has requested control of the safety of both spaces and games from the Cyprus Certification Company (CCC). According to the relative control and guidance of the CCC the Municipality, having as primary light the safety on the spaces decided to take the following actions:

1. Remove all games from the green spaces that are on the streets:

Omorfitas, Assias, Kantaras, Dikaiosinis, Agapis, Myrtou, Ag. Vasiliou, Ilision, Alexias, Olgas, Ag. Maron, Elpidas, Milou, Limnou, Mikonou, Ag. Varvaras, Gravias, Lisistratou and in the Government Residences.

2. To try to appropriate improvements to the games that are located in the following areas:

Irakleous Park, Ag. Mama Park, D. Loizou Park, Pavlou Jesus Park, Panagouli Park,Freedom & Peace Park, Kefallinias Park, Anthousis-Galatias Park, Thali Milisiou Park and Ag. Georgios Park.

Apart from the above mentioned areas, there are a number of small green spaces within neighborhoods, planting and care of which is made by local residents, concerned citizens at their own initiative. The Municipality welcomes these steps and assign the right planting and care of neighborhood green spaces.

The Municipality continued effort within the framework of economic opportunities and resources and personnel available for the maintenance and upgrading of existing and the creation of new parks and green areas.

Integral part of the environmental policy of the Municipality of Lakatamia are general cleaning, cleaning of plots and better and more efficient management of garbage.

[Source: http://www.lakatamia.org.cy]

4. CURRENT STATUS AT LAKATAMIA MUNICIPALITY

4.1. Description of Lakatamia Municipality Buildings

4.1.1. Summary

- Working hours for all City services are 7:30 to 14:00 for the summer season (1st June – 31st August) and 7:30 to 14:30 for the remaining months plus every Wednesday until 18:00.
- There is no central heating system therefore no consumption oil, gas, etc but split units are used in each office for both heating and cooling.
- All municipality buildings utilise solar panels for water heating. No building has a photovoltaic system installation.

Table 1 Energy Consumption at the Lakatamia Municipality Buildings

Energy consumption (kWh)	2009	2010
Town Hall	116.871	114.842
Municipal Theater	20.984	18.391
Municipal Library	1.503	1.503
Municipal Warehouses - 12204	730	5.974
Municipal Warehouses - 12206	2.723	470
Sport Center	6.808	6.658
Municipal Swimming Pool	178.446	174.978
Outpatient Clinic	5.963	5.437
Garbage Shed	4.451	3.717
Municipal Cemetery	6.496	6.470
TOTAL	**344.975**	**336.937**

4.2. Lakatamia Municipality Street Lighting

According to data from the EAC, the total energy consumption in 2009 for street lighting was equal to 2.802.322kWh while the total energy consumption in 2010 for streetlights was equal to 2.816.335kWh

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

Table 1 Lamp Type in the street lighting of the Municipality of Lakatamia

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 Lakatamia Municipality.

4.3. Other energy consumption in the municipality of Lakatamia

The following table lists the power consumption for the years 2009 and 2010 for the illumination of green space ,for drilling, for lighting walkways and bicycle paths and for the crossing lights in the municipality.

Table 2 Other energy consumption

Ebergy consumption (kWh)	**2009**	**2010**
Green spaces illumination	56348	48913
Drilling	27466	7216
Walkways and bicycle paths	58585	64284
Crossing lights	120975	112203
TOTAL	**263374**	**232616**

4.4. Vehicles of the municipality of Lakatamia

The municipal vehicle fleet consists of vehicles of different types, uses and engine displacement. The table below shows the fuel consumption (in liters) of vehicles of the municipality for the years 2009 and 2010.

Table 3 Vehicle fleet of the municipality of Lakatamia

KPH168	954	944	GASOLINE
KPH712	756	826	GASOLINE
KPH296	996	1.012	GASOLINE
KPH059	992	818	DIESEL
RL090	876	953	DIESEL
EMN	1.058	218	DIESEL
KQN244	3.686	3.417	DIESEL
EXE173	1.054	1.509	GASOLINE
HXX722	692	903	GASOLINE
KUL315	42	98	GASOLINE
KUL853	107	332	GASOLINE
KUL075	92	100	GASOLINE
KUL501	303	213	GASOLINE
KUL535	241	145	GASOLINE
KUW699	19.741	18.384	DIESEL
KUY288	760	1.222	DIESEL
KUY302	1.025	1.052	DIESEL
KUY739	1.030	1.614	DIESEL
KUZ235	7.354	8.376	DIESEL
KUZ938	7.019	6.446	DIESEL
ABK581	567	439	GASOLINE
BBK536	474	406	GASOLINE
KJX207	1.201	1.142	GASOLINE
KMC604	475	545	DIESEL
HNK221	505	575	DIESEL
KMD419	2.005	1.812	DIESEL
KMD743	1.243	861	DIESEL
VR131	717	893	DIESEL
AAW848	1.020	1.105	DIESEL
EMM395	1.123	840	DIESEL
HBB324	1.978	2.984	DIESEL
EBA795	1.484	1.156	DIESEL
XL374	1.268	696	DIESEL
BBJ456	2.077	2.022	DIESEL
AAD761	815	676	DIESEL
EMM396	1.055	1.058	DIESEL
HBB328	1.895	1.097	DIESEL
KME856	1.072	1.083	DIESEL
SV317	724	728	DIESEL
KHF080	1.658	1.584	GASOLINE
HNK92	1.658	1.584	DIESEL
KMD485	1.361	1.338	DIESEL
BAC276	1.994	1.578	DIESEL
EMP133	3.506	2.278	DIESEL
EBZ539	4.306	5.710	DIESEL
EYP476	5.251	3.939	DIESEL

HPM437	17.369	21.976	DIESEL
KEN172	19.130	17.587	DIESEL
KLF216	17.163	15.342	DIESEL
KML848	4.910	8.041	DIESEL
HXK330	997	1.255	DIESEL
YW275	139	158	GASOLINE
EPX086	175	227	GASOLINE
KET313	7	6	GASOLINE
KET428	57	49	GASOLINE
NO1	707	538	DIESEL
NO1	2.526	2.401	GASOLINE
NO2	790	1.139	DIESEL
NO2	0	89	GASOLINE
NO3	291	89	DIESEL
NO3	784	1.741	GASOLINE
KMZ920	118	152	GASOLINE
CBA461	18	11	GASOLINE
HKK193	0	62	GASOLINE
KLJ731	0	9.058	GASOLINE
EPX083	173	216	GASOLINE
KWK662	1.052	6.318	DIESEL
KWK711	1.074	5.115	DIESEL
KWC987	0	454	DIESEL
KWG893	0	34	DIESEL
KMD477	699	1.167	DIESEL
HKK189	65	19	GASOLINE
KUL470	74	123	GASOLINE
KUY912	1.119	1.273	DIESEL
KUT193	0	2.986	DIESEL
EMN677	0	102	DIESEL
KYE098	0	3.970	DIESEL
KYE098	0	265	GASOLINE
KML786	1.476	1.554	GASOLINE
KML350	2.162	2.148	GASOLINE
NO4	0	549	DIESEL
NO4	0	108	GASOLINE
NO5	0	168	DIESEL
NO5	0	19	GASOLINE
YQ267	4	0	GASOLINE
ΣΥΝΟΛΟ (ΛΙΤΡΑ)	163.289	193.220	GASOLINE/DIESEL

4.5. Public Transport

Public transport in the Municipality conducted by the Transportation Organization of Nicosia District (O.S.E.L). Future goals are to strengthen O.S.E.L of public passenger transport and to increase the use of the bus by 2% are nowadays by more than 10%, which is the goal of the ministry until 2019. Aims by 2013 to install integrated fleet management system and machines issuing and cancellation of tickets to the traveling public can be better and easier movement of buses. Even to enhance a driver through frequent training of staff at all levels. We tried through various programs through the Department of Education and the Ministry of Communications to promote and consolidate the use of the bus to the children, changing the culture of using public means of transport.

Figure 25 Route Network Map of Lakatamia(Source:www.osel.com.cy)

4.6. Road Network of Lakatamia

The planning of the road network of Lakatamia is part of the local project of Nicosia. The following map shows the main road network for Single Nicosia.

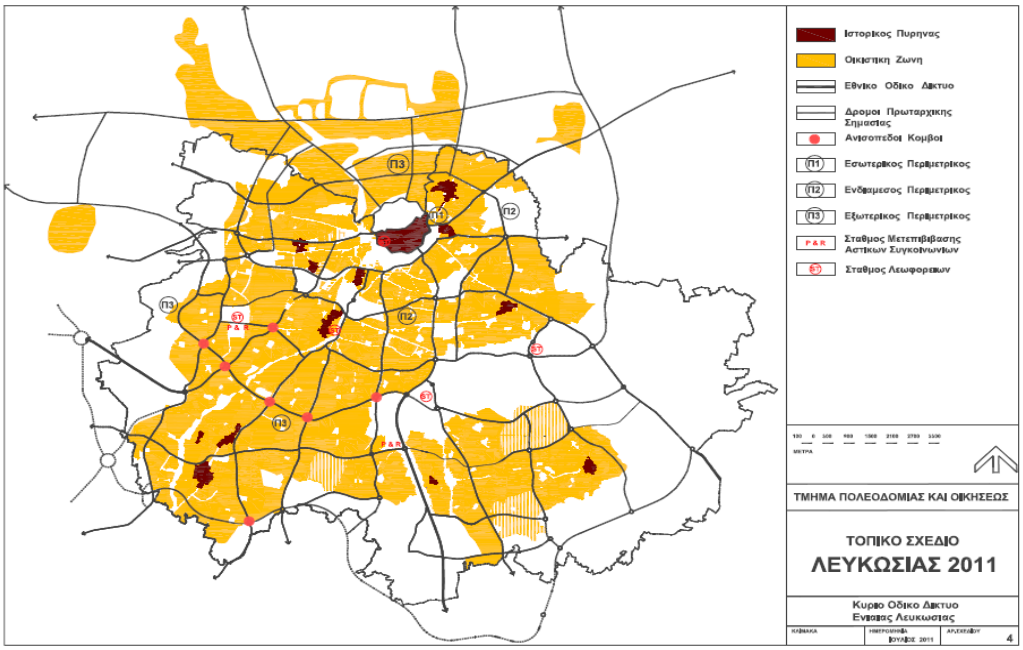


Figure 26 Nicosia Local Plan (Main Road Network for Single Nicosia)

4.7. Cycle Paths Network of Lakatamia Municipality

The largest network of cycle path / pedestrian street is in Linear Park of Pedieos River with a length of 2 kilometers, which is connected to the corresponding work of Strovolos with a length of 4 kilometers. The Municipality is envisaged an extension of pedestrian street / cycle path from the Agios Georgios avenue until the border of Deftera.

The cycle network which provides the Local Plan of Nicosia shown in map below:

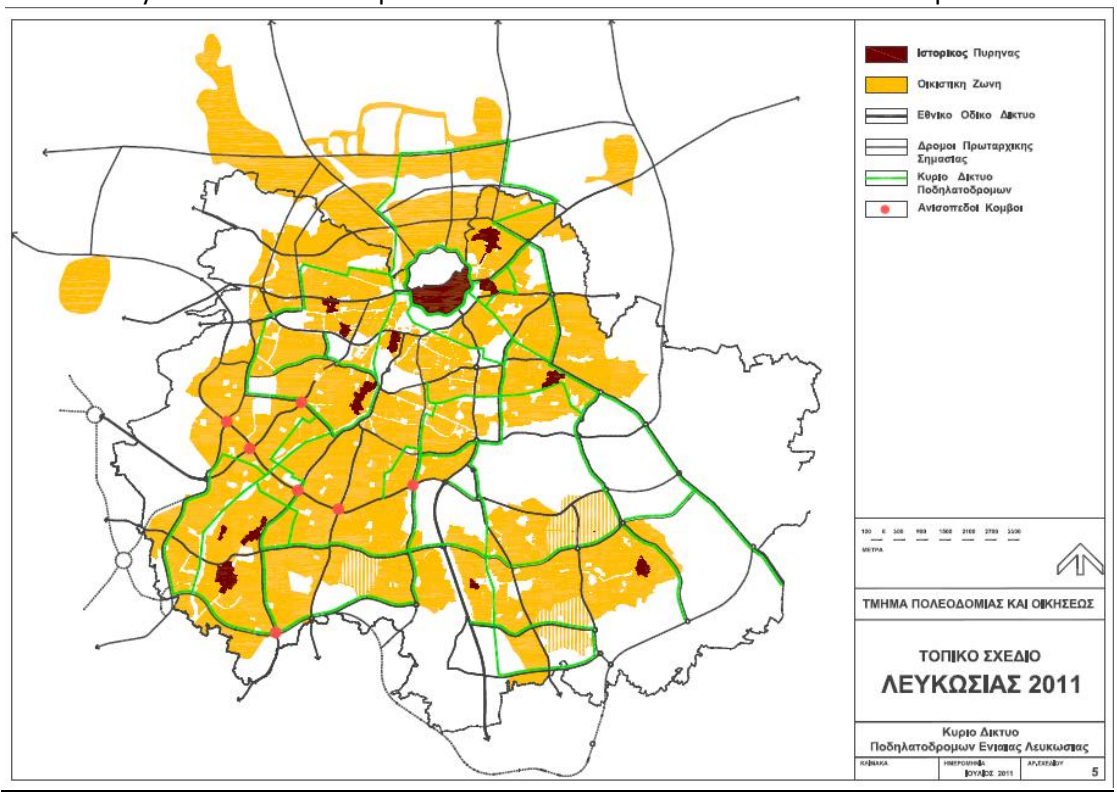


Figure 27 Primary cycle network of Nicosia

4.8. Planned road network projects in the municipality of Lakatamia

The planned road network projects in the municipality of Lakatamia are:

1. Reconstruction of the Pefkou street from the G. Kranidiotis avenue (formerly Orpheus) until Strovolos Avenue. The work has already begun and should be completed by mid 2011.

2. Construction of the road behind the preschool of Anthoupoli.

3. Paving of pavements in accordance with Article 17 on roads around schools and main roads. Completed the fourth phase around the Primary Schools 3rd, 4th, 5th, 6th.

4. Measures of traffic depression and / or creation of walkway in the streets below:

(a) Raised contribution in the streets:

(1) Sporadon-Santorinis, (2) Chamatsou-Vasilikis

(3) Tseriou-Zidrou, (4) I. Kapodistria- Al. Papadiamanti

(b) Construction of camber in the streets:

(1) A. Misiaouli, (2) Pedieou

(3) I. Kapodistria, (4) Myrtou

(c) Installation of traffic lights at the junctions of roads:

(1) Strovolou Avenue (Tseriou) with Th. Georgiadi

(2) Melinas Merkouri Avenue with Axiou

(3) Kenenty- Tseriou- Kallithea

(4) Kallithea- Makariou 3rd Avenue

5. Paving sidewalks in green spaces and suburban streets.

6. Construction of sidewalks.

7. Access road to the New Municipal Cemeteries of Engomi and Lakatamia Area of Nicosia Airport. [Source: www.lakatamia.org.cy]

4.9. Production and management of solid waste in the municipality of Lakatamia

Concerning the production of household waste at municipal level, data are available in Nicosia area and refer to the quantities which produced in the municipalities and Communities of Nicosia district, and driven to the place of disposal in the region of Kotsiatis (data up to 1999). These data, are available to the Statistical Service of Cyprus and resulting from measurements made by the Municipality of Nicosia (daily weigthings of garbage who entered in the disposal site, for one week). The purpose of these measurements was to calculate the annual amount of waste resulting from the disposal area from the municipalities and the communities in order to determine the fees and disposal per Municipality and Community.

Based on the data in Table 4, it seems - as expected, that the amount of household waste, increasing over years and even have nearly doubled from year 1991 to year 1999. This fact is mainly due to the increase in population of Nicosia and the improvement of living standards.

Table 4: Quantities of household waste going to final disposal in Nicosia (tons / year)

Municipalities and greater Nicosia area	1991	1994	1999
Nicosia Municipality	27.361	30.377	36.266
Strovolos Municipality	20.499	24.560	40.522
Engomi Municipality	4.730	6.544	10.534
Ag. Dometios Municipality	5.403	4.515	8.224
Aglantzia Municipality	5.663	6.490	14.451
Latsia Municipality	3.064	3.892	13.067
Lakatamia Municipality	**5.047**	**8.614**	**12.839**
Deftera-Anthoupoli Complex	4.472	1.565	2.361
Dali-Pera Chorio Nisou Complex	4.129	3.949	6.900
Lithrodonta Complex	2.444	3.028	3.427
Ergates Complex		1.940	1.970
Kornos Complex		712	1.170
Geri Improvement Council	1.352	1.262	1.716
Klirou Improvement Council	332	286	754
Gouri-Kalo Chorio		317	369
Mathiatis			312
Palaichori			520
Arediou		260	
Ergates Industrial Area		478	
TOTAL	**84.496**	**98.789**	**155.402**

[Source: Statistical Service of Cyprus]

4.10. Materials Recycling Program in the Municipality of Lakatamia

- The program garbage collection in the Municipality of Lakatamia performed by a contractor of the nonprofit organization Green Dot Cyprus.
- Within the boundaries of the Municipality of Lakatamia except recycling system'' door to door'' placed recycling bins, PMD (blue), paper (brown) and glass and the collection is done every week alongside the houses.

The Company Green Dot (Cyprus) Public Co Ltd (GDC), founded by the CCCI and number of obligated packaging managers on July 17, 2003, as a non-profit organization, in accordance with the provisions of Law 32 (I) / 2002. The creation of GDC stems from N.32 (I) / 2002 which sets out the framework responsibilities of business considered packaging managers should ensure the recovery and recycling of packaging.

Meanwhile, the organization is part of the largest global network of collecting societies packaging of Packaging Recovery Organisation Europe based in Brussels (PRO EUROPE) and includes 31 other similar systems around the world (more information on the organization's website www.pro-e.org). With the above contribution, the system became the sole manager of the Green Dot mark in Cyprus.

[Source: http://www.csr-ccci.org.cy]

4.11. Clothes ryecycling program in the municipality of Lakatamia

Since early 2011the Municipality of Lakatamia in collaboration with the nonprofit organization "ENVIRONMENTAL ANAKYKLOS" started picking up clothes in the municipality.

After sorting, some clothes are offered free of charge to indigent persons in Cyprus. Another part of the clothing available to people with low income, shops second hand and in bazaars, in symbolic terms, to cover the cost. The clothing will be available for shipment to countries where there is an urgent need, such as natural disaster, war, etc. The largest percentage exported to reuse. Part of the material unsuitable for reuse clothes, recycled clothes cleaning up, tow, insulation and other materials.

The spaces which have been placed metal storage collection in the municipality are:

- Char. Mouskou street (Parking area of the Town Hall)
- Agios Georgios avenue 67
- Ioannis Kappodistrias street-Steet of the High School of Archaggelos
- Al. Panagouli street (Achaion Park)
- Glyfou street-Fidiou (opposite from the Ag. Chrysostomos church
- Agios Mamas street (Parking area)
- Sporadon street (Agios Neophytos church)
- Agios Demetrianos street (Agia Paraskevi church

[Source: Press info of Lakatamia, April Issue 2011]

4.12. Green wastes

The collection of green wastes that are pruned, grass clippings etc of public green spaces and parks is carried out by the municipal services of Lakatamia. For 2011, the annual clearance program for prunings was the following:

1. A΄ Period 31 Junuary 2011 - 21 April 2011.

31/01/11 – 11/02/11: Archaggelos-Stelmek
14/02/11 – 25/02/11:K.Lakatamia (west of Makariou avenue)
28/02/11 – 11/03/11: K.Lakatamia (east of Makariou avenue)
14/03/11 – 24/03/11: P.Lakatamia (east of Makariou avenue)
28/03/11 – 31/03/11: P.Lakatamia (west of Makariou avenue)
04/04/11 – 08/04/11: Anthoupoli (South of Agios Georgios avenue)
11/04/11 – 21/04/11: Anthoupoli (North of Agios Georgios avenue)

2. B΄ Period 2 May 2011 – 22 July 2011.

02/05/11 – 13/05/11: Archaggelos-Stelmek
16/05/11 – 27/05/11: K.Lakatamia (west of Makariou avenue)
30/05/11 – 10/06/11: K.Lakatamia (east of Makariou avenue)
13/06/11 – 24/06/11: P.Lakatamia (east of Makariou avenue)
27/06/11 – 01/07/11: P.Lakatamia (west of Makariou avenue)
04/07/11 – 08/07/11: Anthoupoli (South of Agios Georgios avenue)
11/07/11 – 22/07/11: Anthoupoli (North of Agios Georgios avenue)

3. Γ΄ Period 3 October 2011 – 23 December 2011.

03/10/11 – 14/10/11: Archaggelos-Stelmek
17/10/11 – 27/10/11: K.Lakatamia (west of Makariou avenue)
31/10/11 – 11/11/11: K.Lakatamia (east of Makariou avenue)
14/11/10 – 25/11/11: P.Lakatamia (east of Makariou avenue)
28/11/11 – 02/12/11: P.Lakatamia (west of Makariou avenue)
05/12/11 – 09/12/11: Anthoupoli (South of Agios Georgios avenue)
12/12/11 – 23/12/11: Anthoupoli (North of Agios Georgios avenue)

4.13. Population of Lakatamia Municipality

The number of residents in the city of of Lakatamia according to the 2001 census was 28,477. The Municipality has a high growth rate in recent years. Today it is estimated that the population amounts to 40,000 inhabitants.

4.14. Events of environmental information and awareness

The Municipality of of Lakatamia organizes each year the Eco Festival of Lakatamia (since 2009), in the Linear Park Pedieos. During the festival, visitors are informed about issues of ecology and get advice of environmental protection, through work, paintings and constructions which present by eco-schools, as well as from information material distributed by other services.

5. INVENTORY OF ENERGY CONSUMPTION IN LAKATAMIA MUNICIPALITY

5.1. Residential Sector

Table 5 Energy Demand in MWh in the Residential Sector in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Geothermal**	**Biomass**	Total
Hot water	2.083	1.822	130	8.461	65	456	**13.017**
Heating and cooling	49.984	1.822	3.508	263	175	4.385	**88.129**
Lighting	2.777	-	-	-	-	-	**2.777**
Kitchen	2.083	-	893	-	-	0	**2.975**
Electrical appliances	12.496	-	-	-	-	-	**12.496**
Total	**69.422**	**31.637**	**4.530**	**8.724**	**240**	**4.840**	**119.394**

5.2. Primary Sector

Table 6 Energy Demand in MWh in the Primary Sector in 2009

Description	**Electricity**	**Fuel Oil**	**Diesel**	**LPG**	**Biomass**	Total
Agriculture, Forestries and Fisheries	1.802	2.156		1.551	721	**6.231**
Mining and Quarrying	901	1.078	1.352	776		**4.106**
Total	**2.703**	**3.235**	**1.352**	**2.327**	**721**	**10.337**

5.3. Secondary Sector

Table 7 Energy Demand in MWh in the Secondary Sector in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Processing	3.229	3.864	2.780	142	47	**10.337**
Water supply, wastewater treatment, waste management	2.458	2.941	2.116			**7.516**
Construction	117	140	101			**358**
Total	**5.804**	**6.946**	**4.997**	**142**	**47**	**17.937**

5.4. Tertiary Sector

Table 8 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	11.868	14.202	10.218	509	170	**36.966**
Hotels and restaurants	1.784	2.135	1.536	76	25	**5.557**
Public administration and social insurance	1.305	1.562	1.124	56	19	**4.065**
Defence, Justice, Police and Fire stations/departments	598	716	515	26	9	**1.863**
Education	1.793	2.146	1.544	77	26	**5.585**
Human Health and social care	353	422	304	15	5	**1.100**
Other Services	5.309	6.393	4.571	228	76	**16.536**
Public Lighting	3.602					**3.602**
Total	**26.612**	**27.536**	**19.811**	**986**	**329**	**75.273**

5.5. Transport

Table 9 Final Energy Consumption in MWh in Transports for the Year 2009

Description	**Electricity**	**Diesel**	**Gasoline**	**Biomass**	Total
Urban and suburban passenger transports	0	3.894	3.610		**7.504**
Other passenger transportation services (taxi, tourism, school buses, etc)	0	62.301	57.766		**120.067**
Commercial ground transportation services and removable services	0	0	0		**0**
Private Vehicles	0	128.495	119.143		**247.639**
Total	**0**	**194.690**	**180.520**		**375.210**

5.6. Total Final Energy Consumption in the Municipality of Lakatamia

Table 10 Final Energy Consumption in MWh in 2009

Sector	**Electricity**	**Fuel Oil**	**Diesel**	**Gasoline**	**LPG**	**Solar**	**Geothermal**	**Biomass**	Total
Residential	69.422	31.637	-	-	4.530	8.724	240	4.840	**119.394**

Primary	2.703	3.235	1.352	-	2.327	-	-	721	**10.337**
Secondary	5.804	6.946	-	-	4.997	142	-	47	**17.937**
Tertiary	26.612	27.536	-	-	19.811	986	-	329	**75.273**
Transports	-	-	194.690	180.520	-	-	-	-	**375.210**
Total	**104.541**	**69.353**	**196.042**	**180.520**	**31.666**	**9.852**	**240**	**5.937**	**598.151**

Figure 28 Share of Final Energy Consumption by Sector in 2009

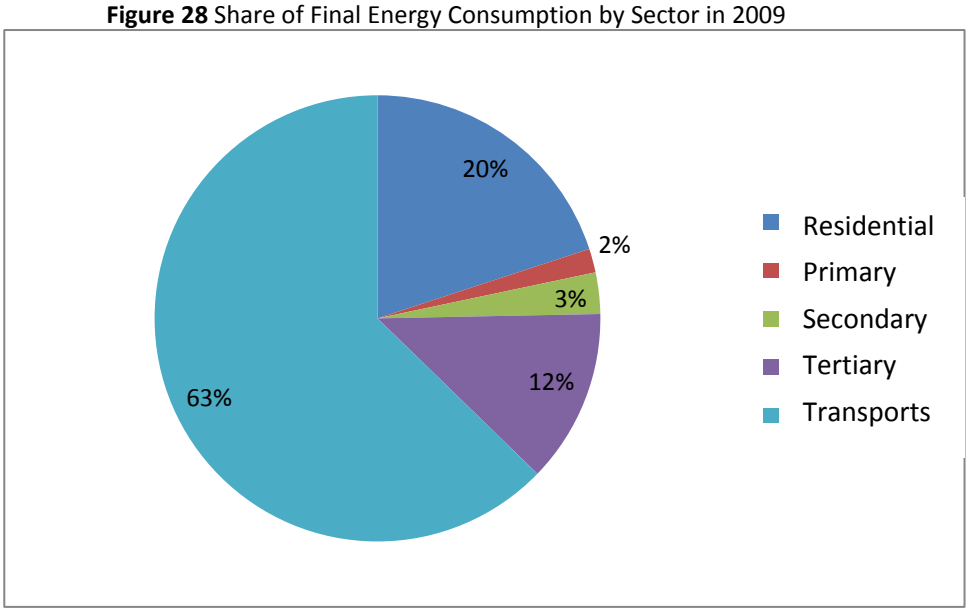
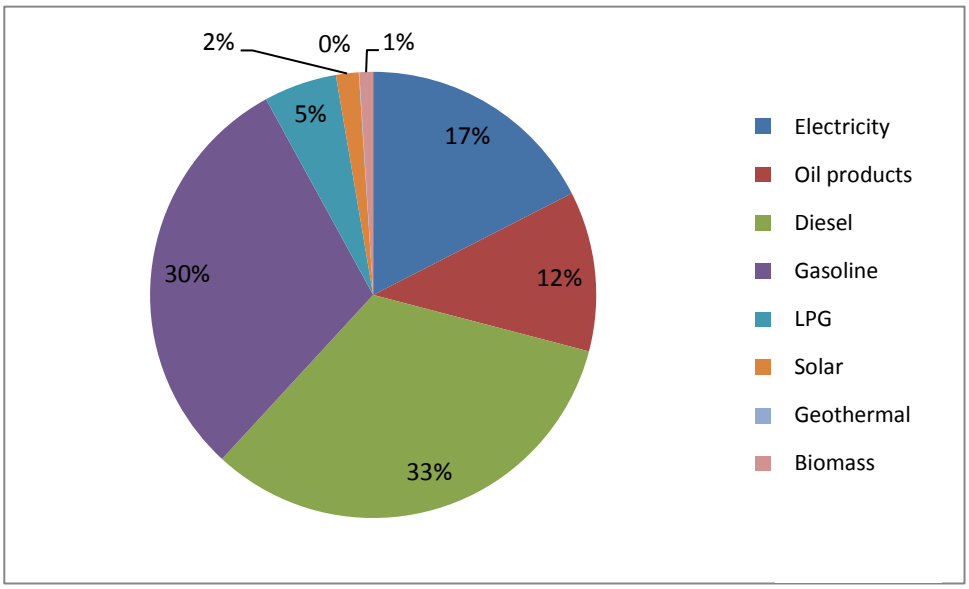


Figure 29 Share of Final Energy Consumption by Energy Source in 2009



6. INVENTORY OF CARBON DIOXIDE (CO_2) EMISSIONS AT LAKATAMIA 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.

Table 11 Coefficients for Calculating CO_2 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

Table 12 CO_2 Emissions in tones in the Residential Sector of Lakatamia Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**SOLAR**	**Geothermal**	**Biomass**	Total
Hot water	1.820	508	31	-	-	-	**2.360**
Heating and cooing	43.686	8.318	842	-	-	-	**52.846**
Lighting	2.427	-	-	-	-	-	**2.427**
Kitchen	1.820	-	214	-	-	-	**2034**
Electrical appliances	10.921	-	-	-	-	-	**10.921**
Total	**60.675**	**8.827**	**1.087**	**-**	**-**	**-**	**70.589**

6.3. Primary Sector

Table 13 CO_2 Emissions in tones in the Primary Sector of Lakatamia Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**Diesel**	**LPG**	**Biomass**	Total
Agriculturee, Forestries and Fisheries	1.575	602	0	372	-	**2.549**
Mining and Quarring	787	301	361	186	-	**1.635**
Total	**2.362**	**902**	**361**	**559**	**-**	**4.184**

6.4. Secondary Sector

Table 14 CO_2 Emissions in tones in the Secondary Sector of Lakatamia Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Processing	2.822	1078	697	-	-	**4.567**
Water supply, wastewater treatment, waste management	2.148	821	508	-	-	**3.477**
Construction	102	39	24	-	-	**165**
Total	**5.073**	**1.938**	**1.199**	**-**	**-**	**8.210**

6.5. Tertiary Sector

Table 15 CO_2 Emissions in tones in the Tertiary Sector of Lakatamia Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	10.373	3.962	3.190	-	-	**16.787**
Hotels and restaurants	1.559	596	2.452	-	-	**2.523**
Public administration and social insurance	1.141	436	369	-	-	**1.846**
Defence, Justice, Police and Fire stations/ departments	523	200	270	-	-	**846**
Education	1.567	599	124	-	-	**2.536**
Human health and social care	309	118	370	-	-	**499**
Other services	4.640	1.773	73	-	-	**7.510**
Public lighting	3.148	-	-	-	-	**3.148**
Total	**23.259**	**7.682**	**4.755**	**-**	**-**	**35.696**

6.6. Transport

Table 16 CO_2 Emissions in for Transports in Lakatamia Municipality in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transports	-	1.040	899	-	**1.939**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	16.634	14.384	-	**31.018**
Commercial ground transportation services and mobile services	-	-	-	-	**-**
Private vehicles	-	34.308	29.667	-	**63.975**
Total	**-**	**51.982**	**44.949**	**-**	**96.932**

6.7. Total CO_2 emissions in Lakatamia Municipality

Table 17 Total CO_2 emissions in Lakatamia Municipality in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	60.675	8.827	-	-	1.087	-	-	-	**70.589**
Primary	2.362	902	361	-	559	-	-	-	**4.184**
Secondary	5.073	1.938	-	-	1.199	-	-	-	**8.210**
Tertiary	23.259	7.682	-	-	4.755	-	-	-	**35.696**
Transports	-	-	51.982	44.949	-	-	-	-	**96.931**
Total	**91.369**	**19.349**	**52.343**	**44.949**	**7.600**	**-**	**-**	**-**	**215.611**

Figure 30 Share of CO_2 Emissions by Sector in 2009

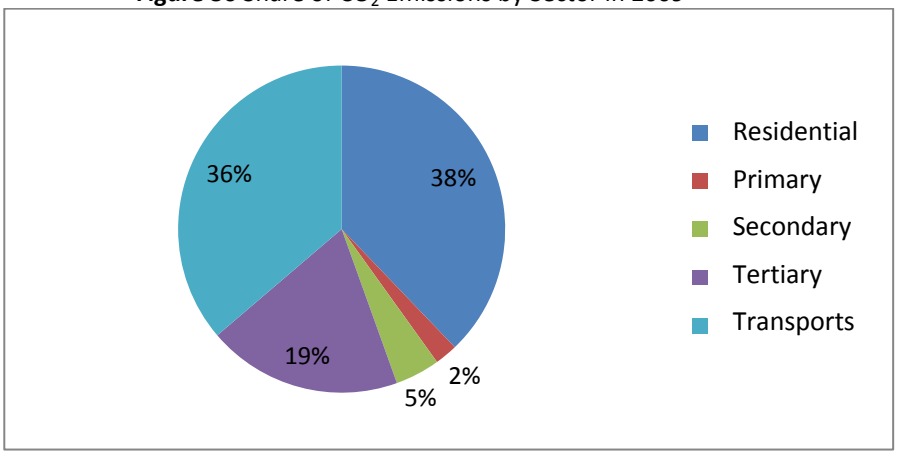
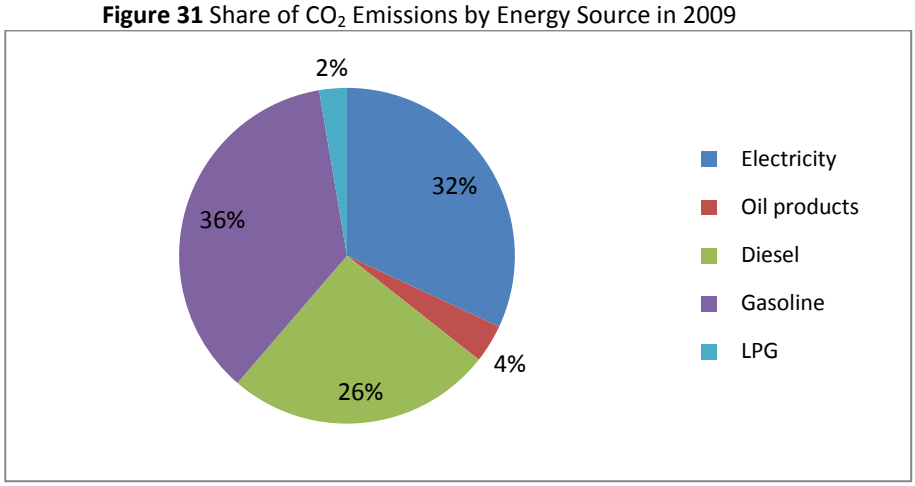


Figure 31 Share of CO_2 Emissions by Energy Source in 2009



6.8. Forecasting/ Projection Scenario of CO_2 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 18)
2. Use of annual growth rates of energy efficiency at the end-use due to the improvement of existing technologies (see Table 19)
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 20).
4. The gradual introduction, use and integration of natural gas into the power generating system.

Table 18 Growth Rates of Energy Consumption per Consumer used in the expected evolution scenario

Sector Descripion	Estimated annual energy consumption rate
Residential	
Hot water	3%
Heating and Cooling	3%
Lighting	3%
Cooking	3%
Refrigerators and freezers	3%
Washing and drying machines	3%
Dishwashers	3%
Televisions	3%
Other electrical appliances	3%
Primary Sector	
Agriculture, forestries and fisheries	1,0%
Mining and quarring	0,5%

Secondary Sector	
Processing	1,5%
Water supply, wastewater treatment, waste management and remediation activities	1,5%
Construction	2,0%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	3,0%
Accommodation services activities and food services	1%
General public administration and social insurance	1,5%
Defense and justice services, police and fire stations/ departments	1,5%
Education	1,5%
Activities relatd to human health and social care	2,0%
Other servics	1,0%
Municipal/ Public lighting	3,0%
Transports (vehicles)	
Private transports	2%
Urban and suburban passenger transports	1,0%
Other road transport services (taxi, tourism, school buses, etc.	1,0%
Freight road transports and removal services	3,5%
Secondary energy production	
Solar energy for electricity generation	3,0%
Wind energy for electricity generation	1,0%
Solar energy for heating and cooling	2,0%
Geothermal energy for heating and cooling	2,0%

Table 19 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%

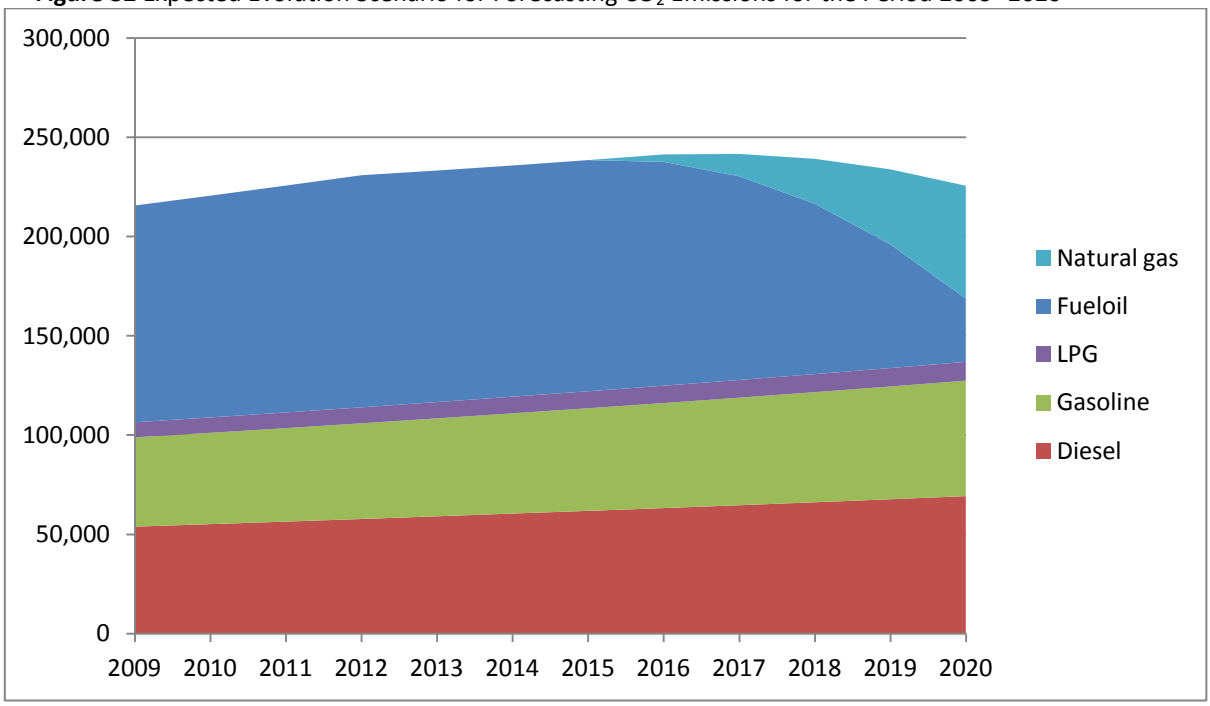
Table 20 Coefficients of Energy Performance of Electricity Generation

	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%

Table 21 Expected Evolution Scenario for Forecasting CO_2 Emissions for the Period 2009 - 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Percentage increase based on 2009
2009	109.155	53.907	44.949	7.600	0	**215.611**	0%
2010	111.664	55.155	45.996	7.751	0	**220.566**	2%
2011	114.235	56.437	47.071	7.905	0	**225.649**	5%
2012	116.870	57.754	48.175	8.063	0	**230.862**	7%
2013	116.587	59.106	49.308	8.225	0	**233.226**	8%
2014	116.410	60.494	50.473	8.391	0	**235.768**	9%
2015	116.395	61.851	51.669	8.560	0	**238.475**	11%
2016	112.716	63.249	52.897	8.734	3.741	**241.336**	12%
2017	102.576	64.687	54.159	8.912	11.258	**241.592**	12%
2018	85.824	66.168	55.455	9.094	22.589	**239.130**	11%
2019	62.303	67.693	56.786	9.280	37.773	**233.836**	8%
2020	31.853	69.261	58.154	9.471	56.852	**225.591**	5%

Figure 32 Expected Evolution Scenario for Forecasting CO_2 Emissions for the Period 2009 -2020



7. LAKATAMIA MUNICIPALITY SUSTAINABLE ENERGY ACTION PLAN FROM 2011 TO 2020

7.1. Introduction

The Sustainable Energy Action Plan that has been prepared for Lakatamia 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)**	**Average growth rate in Emissions (tn CO_2/year)**	**Minimum emissions target in 2020 (tn CO_2/year)**	**Desired minimum (20%) emissions reduction (tn CO_2/year)**
215.611	225.591	907	172.489	53.102

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 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.

Implemented period 2012-2015.

S/N	BUILDING/USE	CONSUMPTION 2010 (kWh)	PROPOSED INTERVENTION	SAVING PERCENTAGE	ENERGY SAVING (KWh)
1	Town Hall	114.842	Roof thermal insulation	20%	22968
2	Municipal Theater	18.391	Roof thermal insulation	30%	5517
3	Municipal Library	1.503	Roof thermal insulation	30%	410

Measure code	**ENEF1**		
Measure name	**Thermal insulation**		
APPLICATION COST			
Investment cost	**Cost (€/m2 area of implementation)**		
Insulation Interventions	**15**		
Operation cost			
Insulation Interventions	**0 €**		
Indirect cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
	28.936		
Financial	Energy Saving (kWh/year)	Average electricity and fuel oil price (€/kWh)	**Saving (€/year)**
	28.936	0,18	**5.208**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
	25.289		
RESULTS – EVALUATION			
Estimated Unit Cost (€/kg CO_2)	**1,19 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒	
DELIVERABLE			
Estimated Total Cost 30.000 €	**Saving 5.208€**	**Emissions Reduction 23.552 Kg_{CO2}/ year**	**Depreciation 6 years**

Measure ENEF2: Voltage Rectifier Installation

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.

Implemented period 2014.

S/N	BUILDING/USE	CONSUMPTION 2010 (kWh)	PROPOSED INTERVENTION	SAVING PERCENTAGE	ENERGY SAVING (KWh)
1	Town Hall	2001	114.842	*Voltage corrector*	15%

Measure Code	**ENEF2**			
Measure Name	**Voltage Rectifier Installation**			
APPLICATION COST				
Investment cost	**Cost (€)**			
Voltage Rectifier Installation	**20.000**			
Operation cost				
Voltage Rectifier Installation	**0 €**			
Indirect cost				
	☐ – **High** ☐ – **Average** ☒ – **Low**			
APPLICATION BENEFITS				
Energy	**Energy Saving (kWh/year)**			
	17.226			
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	**Saving (€/year)**	
	17.226	0,18	**3,101**	
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
	15.056			
RESULTS – EVALUATION				
Estimated Unit Cost (€/kg CO_2)	**1,25 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒		
DELIVERABLE				
Total Cost	**Saving**	**Emissions Reduction**	**Depreciation**	
20.000 €	**3.101€**	**15.056 Kg_{CO2}/ year**	**6,5 years**	

Measure ENEF3: Lamps 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

S/N	BUILDING/ USE	CONSTRUCTION YEAR	SAVING IN 2010 (KWH)	PROPOSED INTERVENTION	SAVING RATE
1	Town Hall	2001	114.842	Lamps Replacement	5%

Measure Code	**ENEF 3**			
Measure Name	**Lamps Replacement**			
APPLICATION COST				
Investment Cost	**Cost (€)**			
Lamps Replacement *(100)*	**500**			
Operation Cost				
Lamps Replacement	**0 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	**Energy Saving (kWh/year)**			
	5.742			
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	**Saving (€/year)**	
	5.742	0.18	**1.033**	
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
	5.244			
RESULTS - EVALUATION				
Estimated unit cost (€/kg CO_2)	**0,10 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒		
DELIVERABLE				
Estimated Cost	**Saving**	**Emissions Reduction**	**Depreciation**	
500 €	**1.080 €**	**5.019 Kg_{CO2}/ year**	**0,5 years**	

Measure ENEF4: 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

S/N	BUILDING/ USE	CONSTRUCTION YEAR	SAVING IN 2010 (KWH)	PROPOSED INTERVENTION	SAVING RATE
1	Town Hall	114.842	Maintenance of air conditioning systems	6 %	6.891
2	Municipal Theater	18.391		6 %	1.103
3	Municipal Library	1.503		6 %	90
4	Outpatient Clinic	5,437		6 %	326

Measure Code	**ENEF 4**		
Code Name	**Maintenance of air conditioning systems**		
APPLICATION COST			
Investment Cost	**Cost (€)**		
Maintenance of air conditioning systems	**0**		
Operation Cost			
Maintenance of air conditioning systems	**700 €/year**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
	8.410		
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	**Saving (€/year)**
	8.410	0.18	**1.514**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
	7.350		
RESULTS - EVALUATION			
Estimated unit cost (€/kg CO_2)	**0,10€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒	
DELIVERABLE			
Estimated Cost **700 €**	**Saving** **1.514 €**	**Emissions Reduction** **7.350 Kg_{CO2}/ year**	**Depreciation** **0,5 years**

Measure ENEF5: Renewable Electricity from Photovoltaic Systems on Municipal Buildings

The installation of electricity generating systems with Photovoltaic panels was studied. The total power from the PV installation will be 2*20 kW and will cover an area of approximately 2*200 m2.

The indirect cost of the measure application is not particularly important, as the following requirements must first be fulfilled: (a) preparation of call for tenders, (b) evaluation of the tenders by specific technical and financial criteria, (c) completion of form (application) to ensure the subsidy from the 2009-2013 Grant Scheme of the Ministry of Commerce, Industry and Tourism. Additionally, the process of connecting the PV systems with the electricity network grid of EAC should be performed. Photovoltaic Systems receive a subsidy on the sold kWh (selling price is €0,35)

Measure implementation period 2012-2015

Measure Code	**ENEF 5**		
Measure Name	**Renewable Electricity on Municipal Buildings**		
APPLICATION COST			
Investment Cost	**Total (€)**		
2*Photovoltaic Systems 20 kW	**100.000**		
Operation Cost			
2*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)**
2*Photovoltaic System 20 kW	40	1500	**60.000**
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	**Income (€/year)**
2*Photovoltaic System 20 kW	60.000	0.35	**21.000**
Environmental	Emission Reduction Factor (kg_{CO2}/kW.year)	Power (kW)	**Emissions Saving (kg_{CO2}/ year)**
2*Photovoltaic System 20 kW	1.183	40	**50.719**
RESULTS - EVALUATION			
Unitary Cost (€/kg CO_2) ***2*Photovoltaic System 20 kW***	**1,97 €/ $kg_{CO2\ annual\ saving}$**		**Proposed for Implementation** ☒
DELIVERABLE			
Total Cost **100.000 €**	**Income** **21.000 €**	**Emissions Reduction** **50.719 Kg_{CO2}/ year**	**Depreciation** **4.8 years**

7.3. Energy saving through awareness raising campaings

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

The organization of an annual seminar on Renewable Energy Sources (RES) in Lakatamia Municipality was examined. The all-day seminar will be held at the Town Hall, 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	**2.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Green Energy €/year) Environmental (kg CO_2-eq)	**54.000 kWh/year** The financial benefits for interested parties **42.606 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.047€/ $kg_{CO2\ annual\ saving}$**	**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= 20*3*0.3*3*1000kWh/year= 54.000 kWh/year

Measure ESAC2: Organization of annual seminar on Energy Saving

The organization of an annual seminar on Energy Saving in Lakatamia Municipality was examined. The all-day seminar will be held at the Town Hall, 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	**2.000 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**31.500 kWh/year** The financial benefits for interested parties **20.283 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0,10€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*νδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) νδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 60*3*0.25*3*700kWh/year= 94.500 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 four (4) 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

Measure Code	**ESAC 3**	
Measure Name	**Organization of educational presentations to students**	
APPLICATION COST		
Cost of Measure	**1.200 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**1.344.000 kWh/year** The financial benefits for interested parties **667.000kg$_{CO2}$/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.002€/ 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*4*0.4*3*800kWh/year= 1.344.000 kWh/year

Measure ESAC4: Organization of "Day without lighting"

The organization of an annual day without lighting in Lakatamia Municipality was examined. The measure will apply for a period of 10 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 (and every following year)

Measure Code	**ESAC 5**	
Measure Name	**Organization of "Day without lighting"**	
APPLICATION COST		
Cost of Measure	**5000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**2.160.000 kWh/year** The financial benefits for interested parties **1.397.720kg$_{CO2}$/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.002€/ 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= 3000*10*0.20*3*120kWh/year= 2.160.000 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 Lakatamia website was examined. In addition, there will be a special article on energy in the Municipality quarterly newspaper. The measure will apply for a period of 10 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: 2010

Measure Code	**ESAC 6**	
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)	**3.375.000 kWh/year** The financial benefits for interested parties **1.500.000 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= 1500*10*0.15*3*455kWh/year= 3.375.000 kWh/year

Measure ESAC6: Organization of "Cycling Day"

The organization of an annual "Cycling Day" in Lakatamia Municipality was examined. The measure will apply for 10 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 6**	
Measure Name	**Organization of "Cycling Day"**	
APPLICATION COST		
Cost of Measure	**2000 €**	
Indirect Cost	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**994.680 kWh/year** The financial benefits for interested parties in terms of fuel saving **258.000 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.008€/ $kg_{CO2\ annual\ saving}$**	**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 ESAC7: Organization of "Eco-cars Day"

The organization of "Eco-cars Day" in Lakatamia Municipality was examined. The measure will be held annually for 9 consecutive years.

The indirect application cost of the measure can be considered as average as, apart from organizing the event the interested party should bear their own cost of an eco-car purchase.

Start of Implementation: June 2012

Measure Code	**ESAC 7**	
Measure Name	**Organization of "Eco-cars Day"**	
APPLICATION COST		
Cost of Measure	**3600 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**746.010 kWh/year** The financial benefits for interested parties in terms of fuel saving **192.600 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.019€/ $kg_{CO2\ annual\ saving}$**	**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= 60*9*0.05*3*9210kWh/year= 746.010 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	**10.000 €**			
(b) Leaflets on sustainable mobility	**5.000 €**			
(c)Articles in the Municipality's Newspaper	**0 €**			
(d) TV Spots	**3000 €**			
(e) Radio Spots	**2000 €**			
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	30.000	5%	1100	**1.650.000**
(b) Leaflets on sustainable mobility	30.000	5%	2210	**3.315.000**
(c)Articles in the Municipality's Newspaper	60.000	2%	900	**108.000**
(d) TV Spots	6.000	4%	1100	**240.000**
(e) Radio Spots	6.000	3%	1000	**180.000**
Financial				
	The financial benefits for interested parties in terms of energy saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
(a) Leaflets on RES and ES	1.067.704			
(b) Leaflets on sustainable mobility	837.520			
(c)Articles in the Municipality's Newspaper	698.861			
(d) TV Spots	341.665			

(e) Radio Spots	232.954	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
(a) Leaflets on RES and ES	**0.006 €/ $kg_{CO2\ annual\ saving}$**	☒
(b) Leaflets on sustainable mobility	**0.006€/ $kg_{CO2\ annual\ saving}$**	☒
(c)Articles in the Municipality's Newspaper	**0 €/ $kg_{CO2\ annual\ saving}$**	☒
(d) TV Spots	**0.009 €/ $kg_{CO2\ annual\ saving}$**	☒
(e) Radio Spots	**0.008 €/ $kg_{CO2\ annual\ saving}$**	☒
DELIVERABLE		
Total Cost **20.000 €**		**Emission Reduction** **3.178.704 Kg_{CO2}/ year**

Measure ESAC9: Organization of an annual seminar on "Energy Saving in Industry"

Organization of an annual seminar on "Energy Saving in Industry" in Lakatamia Municipality was examined. The all-day seminar will be held in the Town Hall for 3 consecutive 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), stakeholders will have to bear the costs of implementing energy saving technologies in industry on their own.

Measure Implementation Period:2013-2015

Measure Code	**ESAC 9**	
Measure Name	**Organization of an annual seminar on "Energy Saving in Industry"**	
APPLICATION COST		
Cost of Measure	**1.500 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2)-eq	**648.000 kWh/year** The financial benefits for interested parties **508.700 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.003€/ $kg_{CO2\ annual\ saving}$**	**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 industry (kWh)
Calculation: ES= 30*3*0.8*1.5*6000kWh/year= 648.000 kWh/year

7.4. Energy Saving in Transport

Measure EST1: Promotion of vehicles with low CO_2 emissions

The possibility of the promotion of vehicles with low CO_2 emissions by providing facilities was examined. Two cases were examined: (a) free parking space and (b) charging points for electric vehicles. The facilities should be provided for 5 years.

The indirect application cost of this measure can be considered low since interested parties would bear the cost of purchasing an eco-car on their own.

Measure Implementation Period: June 2012 – 2017

Measure Code	**EST1**			
Measure Name	**Promotion of vehicles with low CO_2 emissions**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
(a) Free Parking Spaces (10 spaces)	**35.000 € * loss of income**			
(b) Charging points for electric vehicles (3 points)	**3000 €**			
Indirect Cost				
APPLICATION BENEFITS				
Energy	Number of spaces	Traffic (5 years)	ES per visit + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
(a) Free Parking Spaces (10 spaces)	10	36.500	70	**2.555.000**
(b) Charging points for electric vehicles (3 points)	3	10.950	80	**876.000**
Financial				
	The financial benefits for interested parties from ES			
Environmental	**Emissions saving (kg_{CO2}/ year)**			
(a) Free Parking Spaces (10 spaces)	**645.393**			
(b) Charging points for electric vehicles (3 points)	**221.278**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**	
(a) Free Parking Spaces (10 spaces)	**0.054 €/ kg_{CO2} annual saving**		☒	
(b) Charging points for electric vehicles (3 points)	**0.014 €/ kg_{CO2} annual saving**		☒	
DELIVERABLE				
Total Cost 38.000 €	**Emission Reduction 866.671 Kg_{CO2}/ year**			

Measure EST2: Energy saving in the Municipality's fleet

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: 2013-2020

Measure Cost	**EST 2**	
Measure Name	**Energy saving in the Municipality's fleet**	
APPLICATION COST		
Cost of measure	**Total (€)**	
Purchase of 5 eco-cars	**60.000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy	**Energy Saving (kWh/year)**	
Purchase of 5 eco-cars	**46.050**	
Financial	**Saving (€/year)**	
Purchase of 5 eco-cars	**5000**	
Environmental	**Emissions saving (kg_{CO2}/ year)**	
Purchase of 5 eco-cars	**11.632**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for implementation**
Purchase of 5 eco-cars	**5.158 €/ $kg_{CO2\ annual\ saving}$**	☒
DELIVERABLE		
Total Cost **60.000 €**	**Emissions Reduction** **11.632 Kg_{CO2}/ year**	

Measure EST3: Energy saving in transports by promoting the use of bicycles (Bicycle Rental System)

The possibility of promoting bicycle use by installing a bicycle rental system was examined. The bicycle rental system will be in cooperation with municipalities in Lakatamia or other private (touristic) companies. The application period is for 8 years starting in 2012.

The indirect application cost of the measure can be considered low as interested parties (to be aware of bicycle use) would have to bear the minimal cost of bicycle rental.

Start of Implementation: 2014

Measure Code	**EST 3**			
Measure Name	**Bicycle Rental Systems**			
APPLICATION COST				
Cost of measure	**Total (€)**			
2 spaces and 20 bicycles	**40.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	Number of Bicycles	Traffic per yeas	ES per bicycle + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
2 spaces and 20 bicycles	20	1095	40	**876.000**
Financial				
	Proposed for implementation			
Environmental	**Emissions saving (kg_{CO2}/ year)**			
2 spaces and 20 bicycles	**221.278**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for implementation**	
2 spaces and 20 bicycles	**0.18 €/ $kg_{CO2\ annual\ saving}$**		☒	
DELIVERABLE				
Total Cost **40.000 €**	**Emissions Reduction** **221.278Kg_{CO2}/ year**			

Measure EST4: Energy Saving in Transport by Upgrading the Cycle Path Network in Lakatamia

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

The indirect application costs is considered low.

Start of Implementation: 2014 (for 6 years)

Measure Code	**EST 4**			
Measure Name	**Upgrade of Cycle Path Network**			
APPLICATION COST				
Cost of measure	**Total (€)**			
Upgrade of Cycle Path Network	**100.000 €**			
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	10	73.000	20	**14.600.000**
Financial				
	The financial benefits for interested parties from fuel saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
Upgrade of Cycle Path Network	**3.687.960**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for implementation**	
Upgrade of Cycle Path Network	**0.03 €/ $kg_{CO2\ annual\ saving}$**		☒	
DELIVERABLE				
Total Cost **100.000 €**	**Emissions Reduction** **3.687.960Kg_{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 Lakatamia Municipality in 2009 was 2.816.335 kWh.

Two cases were examined: (a) replacement of current lamps with economic LED lamps and (b) optimization study of street lighting operating hours.

The indirect application cost can be considered low.

Year of Measure Implementation: 2013

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	**600.000 €**			
(b) Optimization of Street Lighting operation hours	**4.000 €**			
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	3000	800	50	**1.200.000**
(b) Optimization of Street Lighting operation hours	3000	800	5	**120.000**
Financial	Energy Saving (kWh/year)	Average Electricity Price (€/kWh)	**Saving (€/year)**	
(a) Replacement of current lamps with economic LED lamps	1.200.000	0.13	**156.000**	
(b) Optimization of Street Lighting operation hours	120.000	0.13	**15.600**	
Environmental	**Emissions Saving**			

	(kg_{CO2}/ year)		
(a) Replacement of current lamps with economic LED lamps	**946.800**		
(b) Optimization of Street Lighting operation hours	**94.680**		
RESULTS - EVALUATION			
Unitary Cost (€/kg CO_2)		**Proposed for implementation**	
(a) Replacement of current lamps with economic LED lamps	**0.63 €/ $kg_{CO2\ annual\ saving}$**	☒	
(b) Optimization of Street Lighting operation hours	**0.042 €/ $kg_{CO2\ annual\ saving}$**	☒	
DELIVERABLE			
Total Cost **604.000 €**	**Saving** **171.600€**	**Emissions Reduction** **1.041.480 Kg_{CO2}/ year**	**Depreciation** **3.5 years**

7.6. Investments of Lakatamia Municipality in RES

Measure RES1: Renewable Electricity with Photovoltaic Systems

The creation of 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 €0,31)

Measure Implementation Period: 2014-2016

Measure Code	**RES 1**			
Measure Name	**Renewable Electricity with Photovoltaic Systems**			
APPLICATION COST				
Investment Cost	**Total (€)**			
Photovoltaic Park 150 kW	**450.000**			
Operational Cost				
Photovoltaic Park 150 kW	**0 € (negligible cost for the periodical cleaning of the frames)**			
Indirect Cost				
APPLICATION BENEFITS				
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	**Green Energy (kWh/year)**	
Photovoltaic Park 150 kW	150	1500	**225.000**	
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	**Income (€/year)**	
Photovoltaic Park 150 kW	225.000	0.31	**69.750**	
Environmental	**Εξοικονόμηση Εκπομπών (kg_{CO2}/ year)**			
Photovoltaic Park 150 kW	**177.525**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**		
Photovoltaic Park 150 kW	**2.535 €/ $kg_{CO2\ annual\ saving}$**	☒		
DELIVERABLE				
Total Cost 450.000 €	**Income 69.750 €**	**Emission Reduction 177.525 Kg_{CO2}/ year**	**Depreciation 6.5 years**	

7.7. Development of Green Spaces in Lakatamia Municipality

Measure DGS1: Development of green spaces

Regarding the development of green spaces in Lakatamia 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 in Lakatamia Municipality**	
APPLICATION COST		
Cost of measure	**Total (€)**	
(a) Planting of trees (2000 trees)	**4000 €**	
(b) Care of Green Spaces	**4000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Environmental	**Emissions Saving (kg_{CO2}/ year)**	
(a) Planting of trees (2000 trees)	**80.000**	
(b) Care of Green Spaces	**40.700**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
(a) Planting of trees (2000 trees)	**0.05 €/ $kg_{CO2\ annual\ saving}$**	☒
(b) Care of Green Spaces	**0.10 €/ $kg_{CO2\ annual\ saving}$**	☒
DELIVERABLE		
Total Cost **8.000 €**	**Emission Reduction** **120.700 Kg_{CO2}/ year**	

7.8. Summary of Measures of Lakatamia Municipality

Table 22 Brief Presentation of Measures Taken by Lakatamia 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				
ENEF1 – Insulation Interventions	2012-2015	30.000	23.552	6 years
ENEF2 – Voltage Rectifier Installation	2014	20.000	15.056	6,5 years
ENEF 3 – Lamps Replacement	2012	500	5.244	0,5 years
ENEF4 – Maintenance of Air Conditioning Systems	2012-2020	700	7.350	0,5 years
ENEF5: Renewable Electricity from Photovoltaic Systems on Municipal Buildings	2012-2015	100.000	50.719	4,8 years
Energy Saving through Awareness Raising Campaigns				
ESAC1: Organization of an annual seminar on Renewable Energy Sources	2012-2014	2.000	42.606	-
ESAC2: Organization of an annual seminar on Energy Saving	2012-2014	2.000	20.283	-
ESAC3: Organization of educational presentations to students	2010-2020	1.200	667.000	-
ESAC4: Organization of “Day without lighting”	2012-2020	5.000	1.397.720	-
ESAC5: Information about energy in the Municipality website and newspaper	2010-2020	0	1.500.000	-
ESAC6: Organization of “Cycling Day”	2012-2020	2.000	258.000	-
ESAC7: Organization of “Eco-Cars Day”	2012-2020	3.600	192.600	-
ESAC8: Raising awareness through informational leaflets and messages	2012-2020	20.000	3.178.704	-
ESAC9: Organization of an annual seminar on Energy Saving in Industries	2013-2015	1.500	508.700	-

Energy Saving in Transports				
EST1: Energy saving in transports by promoting eco-cars (hybrid and electric)	2012-2017	38.000	866.671	-
EST2: Energy saving in the Municipality's fleet	2013-2020	60.000	11.632	-
EST3: Energy saving in transports by promoting the use of bicycles (Bicycle Rental System)	2014-2020	40.000	221.278	-
EST4: Energy Saving in Transport by Upgrading the Cycle Path Network in Lakatamia	2014-2020	100.000	3.687.960	-
Energy Saving in Street Lighting				
ESSL1: Energy saving in street lighting	2013	604.000	1.041.480	3.5 years
Investments of Lakatamia Municipality in RES				
RES1: Investments of Lakatamia Municipality in renewable electricity	2014-2016	450.000	177.525	6.5 years
Development of Green Spaces in Lakatamia Municipality				
DGS1: Development of green spaces in Lakatamia Municipality	2012-2020	8.000	120.700	-
TOTAL		**1.488.500**	**13.994.230**	

7.9. Contribution of National Measures on the Sustainable Energy Action Plan of Lakatamia 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.

Table 23 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)	2.813	1.371	430	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	1.350	658	207	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	473	230	72	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	338	165	52	0
5	Legislation on energy efficiency of appliances (Equation 1)	2.003	1.266	448	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	1.800	1.500	3.000	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	250	145	52	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	1.371	172	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	981	0
10	Plan of single urban transport system (Equation 3)	0	0	0	57.188
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	37.839
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	9.081
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	4.843
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	6.054
	TOTAL PER SECTOR	9.026	6.707	5.414	115.007
	GRAND TOTAL	136.154			

Table 24 Brief Presentation of CO_2 Emissions Reduction from National Measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Emissions Reduction (t CO_2/year)			
		Residential	Tertiary	Indrustry	Transports
1	Legislation on Energy Building Performance (Equation 1)	1.995	1.009	314	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	958	484	151	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	335	169	53	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	239	121	38	0
5	Legislation on energy efficiency of appliances (Equation 1)	1.420	931	326	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	1.276	1.103	2.188	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	177	107	38	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	1.009	126	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	716	0
10	Plan of single urban transport system (Equation 3)	0	0	0	14.446
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	9.558
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	2.294
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	1.223
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	1.529
	TOTAL PER SECTOR	6.401	4.932	3.948	29.051
	GRAND TOTAL	44.333			

Table 25 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%)

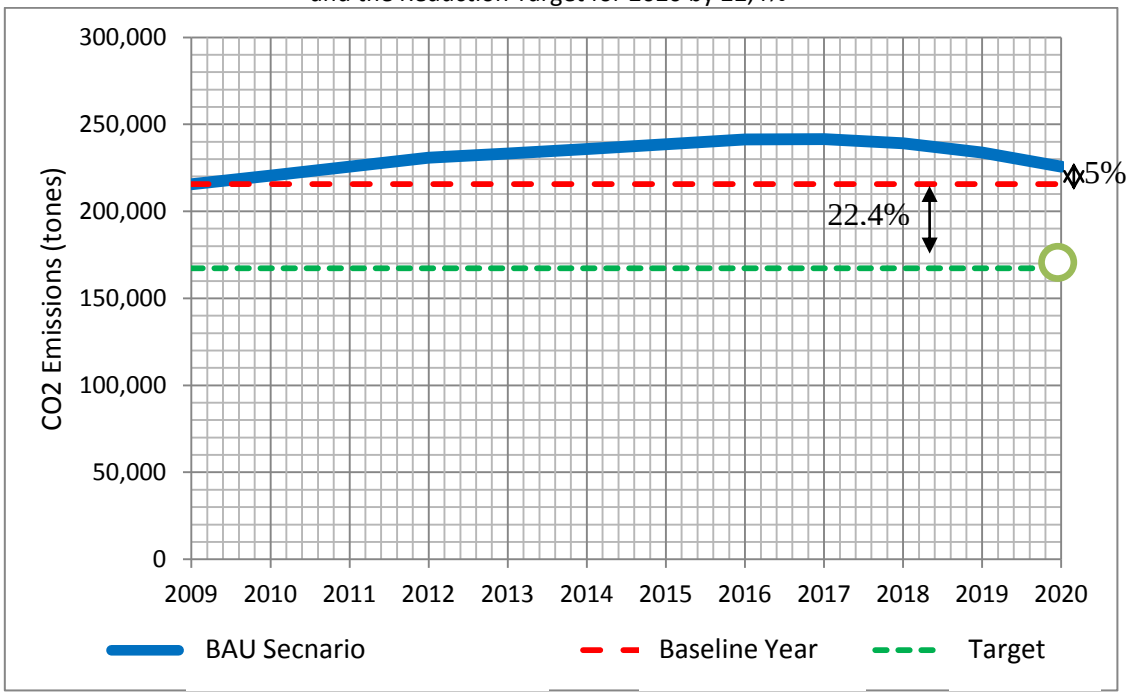
(3) EOS=(N*FO*np)+(ΔO*FO*np)
EOS: Energy Saving in terms of Fuel (MWh) N: Population FO: Fuel Saving per person (MWh) np: Participation percentage (rate) (0-100%) ΔO: Passing Vehicles

7.10. Description of Achieving CO_2 Emission Reduction for 2020

he overall goal of reducing carbon dioxide emissions achieved by implementing the action plan for 2020, is 22,4% 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)	215.611
Expected emissions for 2020 – Expected Development Scenario (tn CO_2/year)	225.591
Estimated emission reduction from national measures for 2020 (tn CO_2/year)	44.333
Estimated emission reduction by the Municipality for 2020 (tn CO_2/year)	13.994
Total estimated emission reduction for 2020 (tn CO_2/year)	58.327
Estimated emissions for 2020 through the application of the Action Plan (tn CO_2/year)	**167.264**
Emission reduction percentage by 2020 compared with 2009	**22,4%**

Figure 33 Schematic of the Expected Evolution Scenario of CO_2 Emissions in Lakatamia Municipality and the Reduction Target for 2020 by 22,4%



Therefore by implementing the Sustainable Energy Action Plan, the Municipality of Lacatamia will reduce carbon dioxide emissions by **22,4%** compared to 2009 (reaching 153.410 tons CO_2), thus exceeding by 2,4% the overall objective of the project to reduce emissions by 20%.

7.11. Financing the Sustainable Energy Action Plan

Funding for Energy Action Plan implementation is expected to be derived from the following resources:

- Municipality budget
- Savings that will result from energy reduction measures in buildings, vehicles and street lighting in the Municipality
- Incomes form the investments of the Municipality in Renewable Energy Sources
- Funding from the Grant Scheme of Ministry of Commerce, Industry and Tourism for Renewable Energy Sources and Energy Saving promotion.
- Possible funding from the Sustainable Development and Competitiveness Program of the Planning Bureau.
- Potential funding from the Fund created for Emissions Trading Scheme.
- Possible funding from other European Programmes.

Sources of energy data

- Consumption of fuels and heating fuels from oil companies within the administrative limits of Lakatamia 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 Lakatamia from the Electricity Authority of Cyprus [www.eac.com.cy*]*
- Energy consumption data in municipal buildings in Lakatamia
- 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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