

Sustainable Energy Action Plan

Strovolos Municipality - Cyprus



3 October 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 **CO₂ 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 Strovolos Municipality.

Strovolos is now one of the 7 major municipalities of wider Nicosia area with a population exceeding 60.000 inhabitants and an area of 25 square kilometers.

The year 2009 was designated as the year of referencing/recording energy consumption and CO₂ 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 Strovolos was 1.117.112 MWh. The largest consumer of energy in the municipality is transport with 492.642 MWh, followed by the tertiary sector with 328.491 MWh and households with 253.598 MWh.

The CO₂ emissions in 2009 attributable to the overall energy consumption in the municipality are 493,136 tons.

For the forecast of CO₂ 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 520,612 tons.

The Sustainable Energy Action Plan 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 CO₂ 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 Savings in Municipality public buildings	6
Energy savings via informational campaigns	13
Energy savings in transport	5
Energy savings in street lighting	1
Municipality investments in renewable energy	1
Development of green spaces	1

The estimated annual emissions reduction for 2020 by applying the above measures amounts to 28,313 tons. In addition, it was estimated that the impact on Strovolos Municipality from the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 77,697 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 106,010 tons, annual emissions for 2020 will be limited to 394,482 tons. That is, **20%** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2011 to 2020 amounts to **€3.409.300**. 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 structural funds.
- Potential funding from the Fund created for Emissions Trading Scheme.
- Potential funding from other European programs.

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1. THE ISLE-PACT PROJECT

1.1 Introduction

The main objective of the ISLE-PACT project is the development of Local Sustainable Energy Action Plans, aiming at achieving European sustainability objectives as set by the EU for 2020, namely a reduction of CO₂ 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 CO₂ 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 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	Idalion Municipality
Aglantzia Municipality	Lefkara Municipality
Larnaca Municipality	Geri Municipality
Aradippou Municipality	Ergates Community
Polis Chrysochous Municipality	Psimolofou Community



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 Xatzittofis (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. 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 long 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 era and prehistoric settlements.

The main economic activities of the island are tourism, clothing exports and craft items 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 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. STROVOLOS MUNICIPALITY

3.1 Introduction

The Municipality of Strovolos was established in 1986 and is the second largest Municipality in Cyprus after Limassol, with a population of over 60.000 inhabitants.

The Municipal Council consists of 27 members: The Mayor, the Vice-Mayor and 25 Municipal Counselors. The Mayor chairs the Council Meetings, is the executive authority of the Municipality and heads the Services. In order to facilitate the work of the Municipal Council, the following Municipal Committees have been set up:

The Administrative Committee, the Technical Committee, the Public Health and Sanitation Committee, the European Affairs Committee, the Personnel Committee, the Cultural Affairs Committee, the Environment Committee, the Sports and Youth Committee, the Public Relations Committee, the Social Welfare Committee, the Road Safety Committee, the Refugee Affairs Committee, the Tenders Committee, the Planning and Studies Committee, etc.

The Municipal Service consists of 95 employees and 195 workers. The General Secretary (Town Clerk) is the General Director of the Municipality. The Service is divided into the following Services/Departments, each of which has its own head of Department:

The Administrative Service, the Financial Service, the Technical Service which is divided into a) the Design, Project Management and land division department, b) the Building Permission Department and c) the Constructions Department, the Environment and Parks Department, the Public Health Department, the Cleanliness Department and the Cultural Activities Department.

The Municipal Service has been housed in a modern building since August 2001 located at 100 Strovolos Avenue. The building corresponds to the needs of a modern organization and gives the personnel the facility to work in a pleasant environment, giving it the opportunity to respond to the many needs of Strovolos' citizens. It is a three-floored building with an underground, a ground floor, a middle floor and two other floors. The building has got underground and external parking places, storing places, a reception place, a cafeteria, a room for exhibitions, a room for the conferences of the Municipal Council, rooms for the committees' conferences as well as offices for housing the Services and the Departments of the Municipality. On the North side of the building a square has been formed, which is surrounded by green areas for the organization of outdoors activities. The square is joined with the rest of the building and is extended through a semi-out door portico to the Linear Park and the Pedieos River.

3.2 History

There are references to Strovolos or Strovilos since the Middle Ages from the well-known medieval chronicler Leontios Macheras and from Forius Boustronius a little later. According to these sources, Strovolos was a royal field during the years of Frankish Rule. A major figure in the history of Strovolos was the National Martyr Archbishop Kyprianos, who during the Revolution of 1821, contributed greatly to the preservation of the Greek spirit and Christianity. The Turks hanged Archbishop Kyprianos and other high priest and dignitaries of Cyprus on 9th July 1821.

Strovolos is now a big city that covers an area of 25 km² and is divided into six parishes: Chryseleousa, Ayios Demetrios, Apostle Varnavas and Ayios Makarios, Ayios Vasilios, National Martyr Kyprianos and Stavros.

Strovolos evolved in its present condition after the tragic events of 1974, when Turkey invaded Cyprus and occupied 38% of the island's territory. Due to this event many refugees settled within the city of Strovolos.

Since 1974, a big industrial area was created in Strovolos and the areas of services and manufactures have developed to a great extend.

[Source: <http://www.strovolos.org.cy>]

3.3 Nicosia Local Plan

Until 1990 the control of development in Cyprus was based on the Law on regulating Streets and Buildings and relevant regulations (or amendments). This legislation did not provide sufficient opportunities for effective control of urban development nor the means to allow the exercise of spatial planning policy, or indirect interference in the processes of land purchase. The role of the public sector was essentially regulatory and somewhat negative in character, since it was only possible to respond to private sector initiatives. In Cyprus the spatial planning is responsibility of the central government however the role of the local authorities is during the preparation of the Local Plans.

In view of the strong growth of development pressures caused by the natural population growth, urbanization and the development of industry, commerce, tourism and services, the Cyprus State has decided to implement urban planning legislation, to ensure rationalization of physical development. For this purpose, the Law on town and spatial planning of 1972 and subsequent amendments were voted, which became fully operational for the first time on December 1, 1990.

The Nicosia Local Area Plan was prepared in accordance with the relevant provisions of the Law on town and spatial planning and its launching point was the Nicosia Master Plan (Nicosia Master Plan), prepared by the Cyprus Government in collaboration with Nicosia Municipality and the Development Program of the United Nations (UNDP). The Nicosia Local Plan was first published on the 1st December 1990. The first amendment of the Local Area Plan was published on the 4th October 1996, and the Plan was finalized after studying the appeals, which was completed and published in two phases (1999 and 2000).

During the study of this amendment, consultations were performed with a Joint Council established according to the provisions of Article 12 (1) of the Town and Country Planning Act.

The Nicosia Local Area Plan specifies general principles upon which development in the area under the Local Area Plan will be promoted, monitored and regulated. It is expected that through the implementation of the provisions of the Plan a balanced urban development and consolidation of the wider area of Nicosia will gradually be reached.

The Local Area Plan includes the areas of the Municipalities of Nicosia, Agios Dometios, Engomi, Strovolos, Aglantzia, Lakatamia and Latsia and the area of the Geri Community Council, as shown in Figure 1 *Study Area and Administrative Structure*. The Local Area Plan extends over an area of 19,000 hectares and, according to the report of Statistics Census of Population (October 2001) - *Population Figures by District, Municipality and Community* in October 2001, includes a population of 198.200 people.

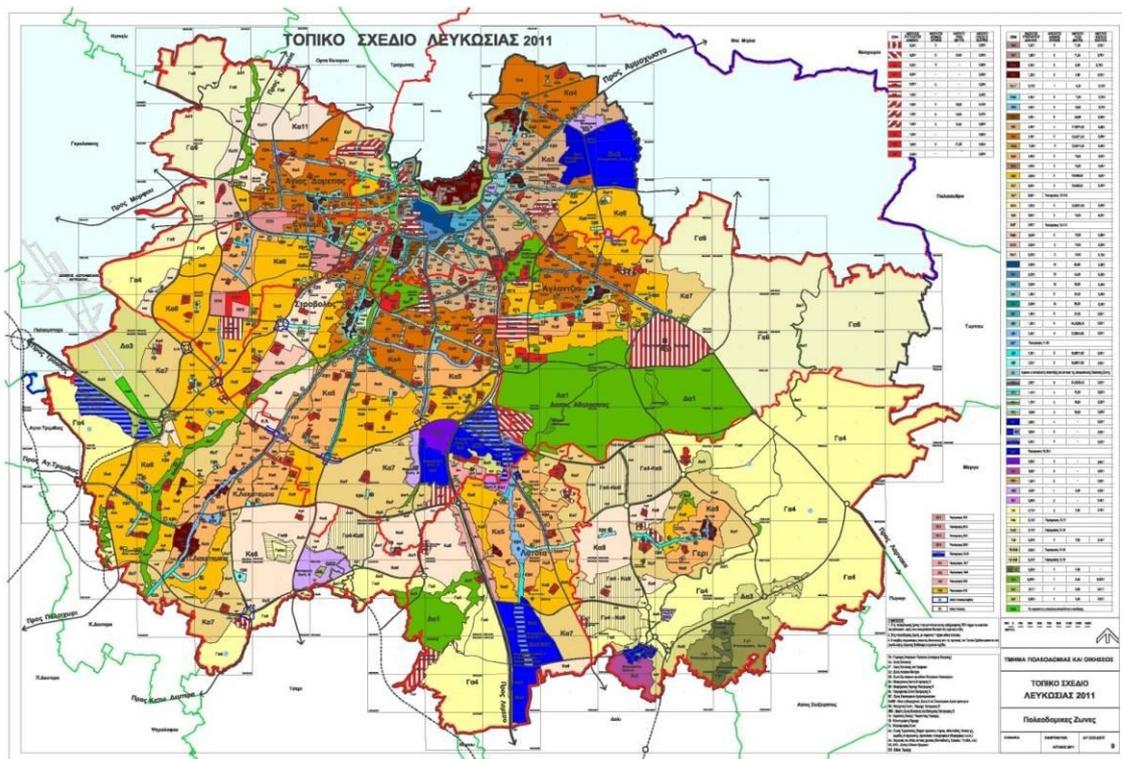


Figure 10. Nicosia Local Area Plan

[Source: Department of Town Planning and Housing]

3.4 Main Objectives of the Local Area Plan

The Nicosia Local Area Plan aims to establish and implement an appropriate long-term planning policy framework that will enable the rational development of Nicosia by the year 2012, which is defined as the horizon year of this Local Area Plan.

When considering this amendment to the Nicosia Local Area Plan, key targets set in the original publication of the draft were re-evaluated and it was confirmed that they form the best choice for

the gradual reorganization and planning of urban development. These objectives, enriched with contemporary urban design concepts are summarized as follows:

(a) The rational distribution of land uses in order to ensure the best economic and functional organization of the city, with the best possible separation of incompatible uses, to protect the quality of life of the population, and to ensure a balanced variety of compatible uses, wherever this is desirable.

(b) The conservation of natural resources and natural environment of the areas under the Local Area Plan, for the benefit of present and future urban population, according to the principles of sustainable development.

(c) The assurance of the potentials of planning and operational reunification of Nicosia after withdrawal of the buffer zone, and the conservation of the operational perspective of broader Nicosia as a single and undivided city.

(d) The upgrade of the organization and, as a result, the operation of the urban cluster of the broader town of Nicosia as a single whole.

(e) The adoption of feasible solutions in relation to the existing situation and the implementation, within the above framework, of adaptable and flexible policy measures that enable future amendments and adjustments to unforeseen changes, if this becomes necessary by prevailing conditions.

(h) The assurance of a beneficial and efficient use of the 12 land 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, sewerage, etc.).

(i) The gradual upgrade of facilities, quality of life and level of service to the entire urban population.

(j) The safeguarding and promotion of organized and integrated urban development through the application of provision bundles and incentives to encourage adoption of the designated Development Areas.

(k) The assurance of the conditions for upgrading the Development Areas to substantial nodes of concentration of future physical development and, therefore, social and economic activity.

(l) The rationalization of the residential areas such that the functional interrelationship of population distribution of job opportunities and services is achieved.

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

(n) The adoption of measures that will contribute to a gradual, but substantial, resolution of operational or other problems encountered in individual urban areas.

(o) The application of a modern multidimensional traffic policy aimed at balancing the current and future operating needs of the entire city and all income groups of population.

(p) The implementation of policy measures that will contribute to the protection and enhancement of the critical role played by the Urban Center as the operational center of the whole of Nicosia, its wider area, but also the whole of Cyprus.

(q) The balanced distribution of commercial activities and uses at strategic points of the urban fabric and the hierarchy of local commercial cores based on the population they serve.

(r) The safeguarding of data and areas of special or exceptional natural, historical, cultural and architectural interest. In particular, the adoption of a program for protection, conservation, regeneration and rejuvenation of the walled town and other historical core is sought after, such that these areas are upgraded to attractive residential areas, employment areas and areas of cultural activities.

(s) The protection and gradual improvement of the natural environment of the areas included in the Local Area Plan, since this is a crucial parameter for ensuring quality of life and balancing of uses and of ecosystems.

(t) The enhancement of opportunities for recreation and entertainment of the entire urban population, and the optimum use and enrichment of appropriate existing green spaces and the development of new ones for the development of an integrated and hierarchical system of free green spaces.

3.5 General Development Strategy

To achieve these goals various alternative options were assessed. As a result, the following General Development Strategy and individual sub-urban policy provisions have been in effect since 1990. The basic criterion for adopting this strategy, which was evaluated and confirmed in the current amendment of the Plan, is to use resources sparingly in order to ensure their continued use by future generations, as well as to organize and consolidate effective development. The General Development Strategy of the Local Plan is based on the principle of organized and integrated development of 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 the stated policy of discouraging the proliferation of various types of development in areas other than those specified, consistent with the guidelines and philosophy promoted by the European Union concerning the organization of urban areas. The General Development Strategy is the backbone of the Nicosia Local Area Plan upon which the individual policy provisions mentioned in various specialized areas of development are based (e.g. residential and commercial development).

[Source: Department of Town Planning and Housing]



Figure 11. Panayia Chriseleousa Church at the old centre of Strovolos



Figure 12. Outdoor space of Municipal Building



Figure 13. Strovolos Municipal Theatre



Figure 14. Akropolis Park



Figure 15. Linear Park of Pedieos



Figure 16. Pedestrian footpath and cycling track of Pedieos



Figure 17. Pedieos River



Figure 18. Old Arxaggelos aqueduct

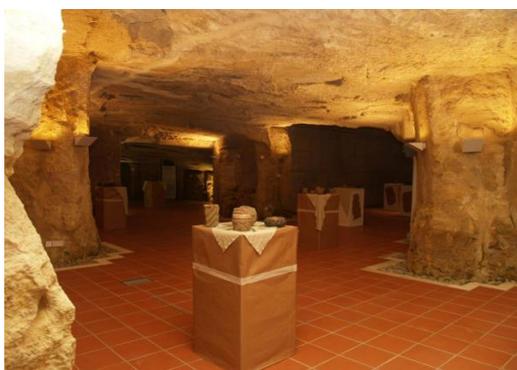


Figure 19. Exhibition area at Akropolis Park



Figure 20. CYTA Municipal Park

[Source: <http://www.strovolos.org.cy>]

3.6 Environmental policy – Development of green spaces

The environment is of utmost interest to the Municipality, which puts every possible effort to protect and improve it, always within the framework of its jurisdiction within the law and the limitation imposed by its financial abilities.

In the area of the Strovolos Municipality 64 organised parks have been created (large and small) and 170 green areas have been formed as well as traffic islands at the main road arteries, totalling 340,000m², while approximately 40.000 trees have been planted in public areas, municipal parking lots, and other areas.

The main municipal parks, where one can find rest, amusement and entertainment, are the following:

- Ayios Dimitrios Park
- Acropoleos Park
- Takis Zembilas Park
- Linear park (pedestrian footpath and cycling track) of Pedieos
- Park and footwalk in Archangelos

3.6.1 Maintenance of the public green areas by residents

There are quite a few small green areas arising from the division of plots. Before an area is sufficiently developed residentially such plots are not intended to be developed, so the Municipality chooses and develops some of them each year, giving priority to the areas that lack green.

If a group of area residents wishes to “adopt” a certain green area and undertake its maintenance (cleaning the area, watering and taking care of the green), the Municipality will undertake the planting of the area apart from its own program.

3.6.2 Protected trees

Apart from specific trees of any kind that are declared protected with a decree from the Minister of Interior based on the law regarding the city planning and zoning (as described in the chapter “Property growth-tree protection”), some types of trees are protected, and for their removal a license is required as follows:

(a) For pines, mulberries, carob trees, cypresses, eucalyptus, oak trees, casuarinas, cedars, cottonwood trees, pistacias, olive trees over 100 years old and some other types, the approval of the Municipality is required as well as a license from the Department of Forests. An application form is submitted to the Municipality (with proof of ownership), which is forwarded to the Department of Forests with recommendations. You can find application forms from the central registry of the Municipality or from the Department of Forests (Ministry of Agriculture, Natural Resources & the Environment).

(b) For palm trees, a license from the Nicosia District Administration Office is necessary, where an application is submitted with proof of ownership.

[Source: <http://www.strovolos.org.cy>]

4. CURRENT ENERGY SITUATION AT STROVOLOS MUNICIPALITY

4.1 Description of Strovolos 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 the hours and every Wednesday until 18:00.
- There is no central heating system (no consumption of oil, gas, etc), split units are used in each office which increase the electricity consumption. The units are used 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 Strovolos Municipality Buildings

Energy consumption (MWh)	2009
Municipal Hall and Municipal Theatre	696
Sports Centre	102
Old Municipal Hall – Photographic Area	4
Municipal Library	8
Municipal storage complex (Demetri Vikella)	
TOTAL	810

Description of Municipal Hall and Municipal Theatre	
Year of construction:	2002-2003
Area:	Hall: Basement, Ground floor, 1 st floor, 2 nd floor, Total 6500 m ² Theatre: Basement, Ground floor and Upper Circle 3000 m ²
Uses	Hall: Offices housing 100 employees Working hours 7.30 – 14.30 and Wednesday 7.30 -18.00

	<p>Theatre:</p> <p>Theatrical shows, concerts and other events.</p> <p>The building has 5 permanent employees.</p> <p>Working hours are usually night-time and depends on the events.</p>
Structural characteristics	<p>The shell and the roof of the building are made entirely of reinforced concrete, with stone lining in some places. The windows and doors are made from aluminium and are double glazing. The floors are made of marble and mosaic. The roof is flat by concrete and inside exist a false ceiling.</p>
Air-conditioning	<p>Hall:</p> <p>The building's heating and cooling system is</p> <ul style="list-style-type: none"> ➤ 1 Chiller 115 KW ➤ 20 units VRV x 20 KW ➤ 5 Split Units x 3,5 KW <p>Theatre:</p> <ul style="list-style-type: none"> ➤ Chiller a) 180 KW ➤ 9 Split Units x 3,5 KW
Power consumption	696.000 kWh/year

4.2 Strovolos Municipality street lighting

The total energy consumption in 2009 for **street lighting** was 6809 MWh, while the corresponding carbon dioxide emissions estimated at 5,951 tons.

The lamp type and power are shown in the table below:

Table 2. Strovolos Municipality Lamp types

LAMP TYPE	LAMP POWER
HPS *	250 W
HPS	150 W
HPS	70 W
Compact	21 W

* High Pressure Sodium

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

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

4.3 Other energy consumptions at Strovolos Municipality

The following table shows the energy consumption in 2009 and 2010 for green space lighting, as well as for the old City Hall lighting needs.

Table 3. Other energy consumptions at Strovolos Municipality

Energy consumption (MWh)	2009
Acropoleos Park	198
Takis Zembilas Park	8
Old City Hall lighting	7
TOTAL	213

4.4 Strovolos Municipality vehicle fleet

The Municipality vehicle fleet consists of vehicles of various types, uses and engine displacement.

The following table shows the types of vehicles in the Municipality vehicle fleet:

Table 4. Strovolos Municipality vehicle types

	TYPE	QUANTITY
GT	Garbage Trucks	18
TR	Trucks (large and small)	4
CR	Cranes/Hoists	3
TA	Tankers	1
SW	Sweepers	2
PUV	Pick up vehicles	28
VN	Vans	15
EX	Excavator (Tractor)	3
MB	Minibus	2
IM	Immobilized	2
LV	Labelling Vehicle	1
VN	Vans with longer top	3
	Total	82

In 2008 the Municipality vehicle fleet covered a total of 732,996 km and approximately 812,977 in 2009. It has been estimated that in 2008 the energy consumption of municipality vehicles was approximately 1.324 MWh and total CO₂ emissions of approximately 403 tons. Correspondingly for 2009, energy consumption was approximately 1.468 MWh and CO₂ emissions were approximately 448 tons.

More specifically, some data for each municipality vehicle is shown in the table below:

Table 5. Strovolos Municipality vehicle fleet

No.	Reg. Plate	Registration Date	Engine Displacement	Service	Code
1	GR 396	19/4/1973	5420	IMMOBILIZED	IM
2	KS 633	20/10/1979	5800	GARDENING	CR
3	UA 382	4/3/1987	10308/1359 KW	CLEANING	GT
4	UA 384	4/3/1987	10308/1359 KW	CLEANING	GT
5	VF 574	16/5/1988	2499	CONSTRUCTION	PUV
6	VU 377	19/10/1988	2500	GARDENING	EX
7	WB 597	17/1/1989	2499	CLEANING	PUV
8	XK 603	30/11/1989	9419	CONSTRUCTION	TR
9	XZ 426	26/4/1990	997	CONSTRUCTION	PC
10	XZ 427 Για πούληση	26/4/1990	997	IMMOBILIZED	IM
11	YT 872	4/10/1990	9419/1580 KW	CLEANING	GT
12	YX 186	3/11/1990	997	PUBLIC HEALTH	PC
13	AAC 590	10/12/1990	2499	CONSTRUCTION	PUV
14	AAC 591	10/12/1990	2499	GARDENING	PUV
15	AAV 360	11/7/1991	2499	CONSTRUCTION	PUV
16	ABP 233	26/11/1991	9419/1580 KW	CLEANING	GT
17	BAY 375	30/6/1992	6925	CONSTRUCTION	LV
18	BBK 411	11/11/1992	9419/1580 KW	ALL SERVICES	TR
19	CAV 254	14/9/1993	9419/1580 KW	GARDENING	CR
20	DAU 136	2/9/1994	1796	MUNICIPAL SECRETARY	PC
21	DAU 553	7/9/1994	2477	PUBLIC HEALTH	PUV
22	DAU 554	7/9/1994	2477	GARDENING	PUV
23	DBB 255	15/12/1994	999	LINE MOVEMENT	PC
24	EEK 923	30/10/1995	2494	PUBLIC HEALTH	PUV
25	EKP 630	1/8/1996	9419/1580 KW	CLEANING	GT
26	EMZ 800	22/2/1997	2477	ALL SERVICES	MB
27	ETK 394	13/1/1998	2477	GARDENING	PUV
28	ETY 688	13/3/1998	1985	MAYOR	PC
29	EYZ 206	13/10/1998	2477	PUBLIC HEALTH	PUV
30	EYZ 208	13/10/1998	2477	GARDENING	PUV
31	HBY 639	18/10/1999	2664	CONSTRUCTION	PUV
32	HEA 886	12/11/1999	4334	GARDENING	TR
33	HEB 286	17/11/1999	7412	PUBLIC HEALTH	SW
34	HEB 906	25/11/1999		CLEANING	GT
35	HKY 774	1/12/2000	9000	CLEANING	GT

No.	Reg. Plate	Registration Date	Engine Displacement	Service	Code
36	HKY 769	1/12/2000	9000	CLEANING	GT
37	HKY 974	6/12/2000	2446	CONSTRUCTION	PUV
38	HMK 118	8/2/2001	4164	ELDERLY CLUB	MB
39	HMP 428	14/3/2001	2446	PUBLIC HEALTH	PUV
40	HMP 978	14/3/2001	2446	GARDENING	PUV
41	HPZ 128	19/11/2001	1686	LINE MOVEMENT	PC
42	HPZ 129	19/11/2001	1686	LINE MOVEMENT	PC
43	HPZ 235	19/11/2001	1686	LINE MOVEMENT	PC
44	HPZ 455	19/11/2001	1686	LINE MOVEMENT	PC
45	HPZ 459	19/11/2001	1686	LINE MOVEMENT	PC
46	HPZ 895	19/11/2001	1686	LINE MOVEMENT	PC
47	HTZ 401	8/3/2002	9000	GARDENING	TA
48	HZN 116	18/12/2002	1298	GARDENING	TR
49	KBB 185	3/6/2003	11946	CLEANING	GT
50	KBB 743	3/6/2003	11946	CLEANING	GT
51	KBZ 192	20/8/2003	5880	GARDENING	CR
52	KEN 055	29/10/2003	2446	PUBLIC HEALTH	PUV
53	KEN 730	29/10/2003	2446	GARDENING	PUV
54	KEN 950	29/10/2003	2446	PUBLIC HEALTH	PUV
55	KEN 952	29/10/2003	2446	CONSTRUCTION	PUV
56	KEN 960	29/10/2003	2446	GARDENING	PUV
57	KHR 354	23/4/2004	11946	CLEANING	GT
58	KHR 805	24/4/2004	11947	CLEANING	GT
59	KHW 445	28/5/2004	4400	ALL SERVICES	EX
60	KKV 694	7/4/2005	2216	ALL SERVICES	EX
61	KPH 538	22/12/2006	1461	LINE MOVEMENT	PC
62	KPH 624	22/12/2006	1461	LINE MOVEMENT	PC
63	KPH 749	22/12/2006	1461	LINE MOVEMENT	PC
64	KPW 121	15/3/2007	10308	CLEANING	GT
65	KQC 110	19/4/2007	10308	CLEANING	GT
66	KQD 548	19/4/2007	2998	CLEANING	GT
67	KQS 028	22/6/2007	2198	GARDENING	VN
68	KQS 120	22/6/2007	2198	GARDENING	VN
69	KQS 397	22/6/2007	2198	PUBLIC HEALTH	VN
70	KQS 219	22/6/2007	2499	CONSTRUCTION	PUV
71	KQS 658	22/6/2007	2499	GARDENING	PUV
72	KRR109	30/10/2007	2499	CLEANING	PUV
73	KUR432	25/11/2008	2499	GARDENING	PUV
74	KUS564	4/12/2008	2497	MAYOR	PC
75	KVQ767	30/4/2009	2998	GARDENING	PUV
76	KWM732	22/9/2009	10518	CLEANING	GT

No.	Reg. Plate	Registration Date	Engine Displacement	Service	Code
77	KWM638	22/9/2009	10518	CLEANING	GT
78	KWM381	22/9/2009	10518	CLEANING	GT
79	KWB371	10/7/2009	2499	CONSTRUCTION	PUV
80	KWB756	10/7/2009	2499	CONSTRUCTION	PUV
81	KWH656	25/8/2009	4485	PUBLIC HEALTH	SW
82	KWQ498	19/10/2009	2494	CLEANING	PUV

4.5 Public Transport

The Nicosia District Transportation Agency (O.S.E.L) is in charge of public transport within City boundaries. Future O.S.E.L. objectives are to strengthen public transport and to increase the use of buses from 2% (current) to more than 10%, which is also the goal of the ministry for 2019. It aims to establish by 2013 a comprehensive fleet management system and ticket issuing / cancellation machines for the improvement and ease of public transport. In addition, the bus driver profession will be strengthened through regular staff training at all levels. O.S.E.L. will promote and consolidate the use of buses to children through various programs of the Ministry of Education and the Ministry of Transport, in an attempt to change the culture of using public means of transport.

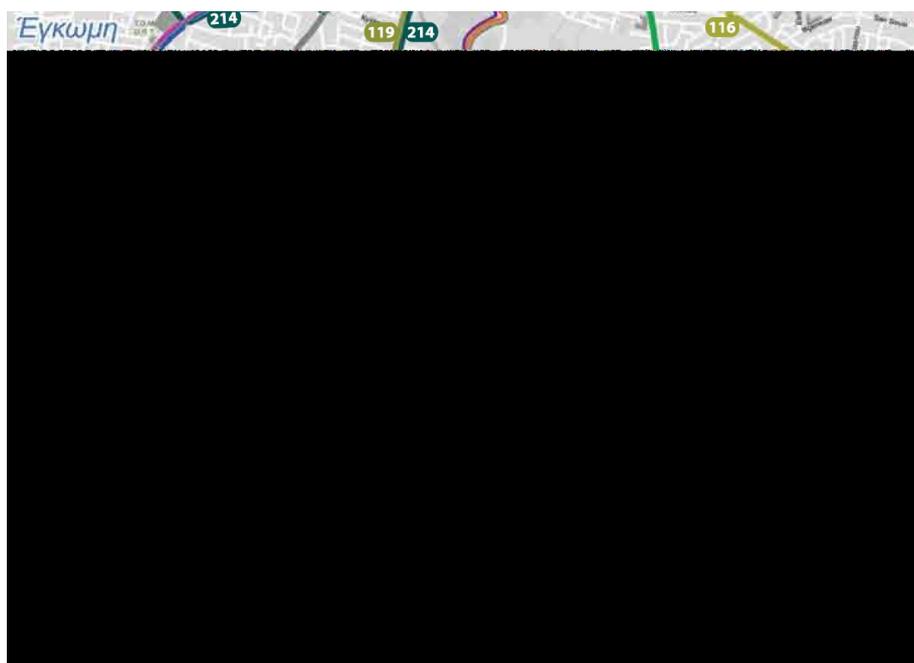


Figure 21. Strovolos Municipality bus routes

[Source: www.osel.com.cy]

4.6 Strovolos Road Network

A fundamental obligation and task of the municipality is the maintenance of an adequate road network that is able to serve all uses. A significant proportion of resources are spent each year for road network projects, including:

- (a) General maintenance of the road network,
- (b) Appropriate configuration of roads, with extensions and alignments where necessary,
- (c) Construction of pavements, sewers for rain water, nodes at intersections and crossroads, parking (side-street, where possible, and elsewhere), bus stops and shelters,
- (d) Installation of traffic lights and appropriate signs (including walkways),
- (e) Installation and maintenance of appropriate street lighting,
- (f) Installation of street name signs and
- (g) Planting and maintaining trees on pavements.

The design of the Strovolos road network falls under the Nicosia Local Area Plan. The map below shows the main roads of unified Nicosia.

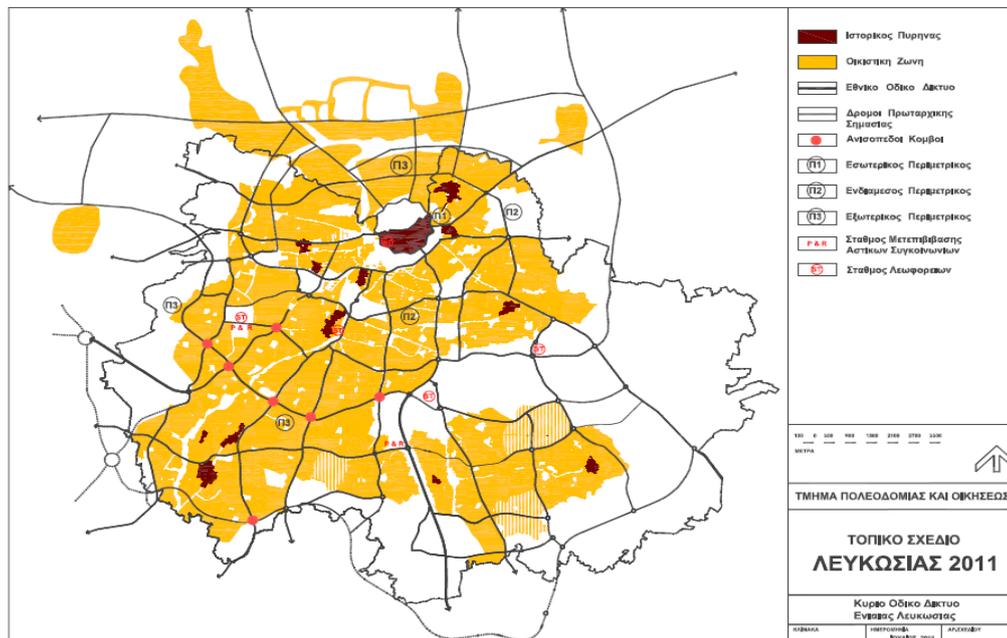


Figure 22. Nicosia Local Area Plan (Main street network of unified Nicosia)

4.7 Strovolos Municipality cycle path network

The cycle paths and footwalks constructed in Strovolos Municipality are:

(a) The footpath and cycle path along the banks of the Pedieos river (Linear Park). This has an approximate length of 4.5km and ends at the Strovolos-Lakatamia boundary, where there is a corresponding project. There is also a 2 km footpath in the Archangelos area.

(b) The 2 km (approximately) cycle path along Demetriou Vikela Street, which connects Spyrou Kyprianou Avenue (south bypass) with the new GSP.

(c) The 3 km footpath and cycle path at Archangelos Area, which has been constructed as part of land separation into a large number of plots.

The cycle path network included in the Nicosia Local Area Plan can be seen in the map below:

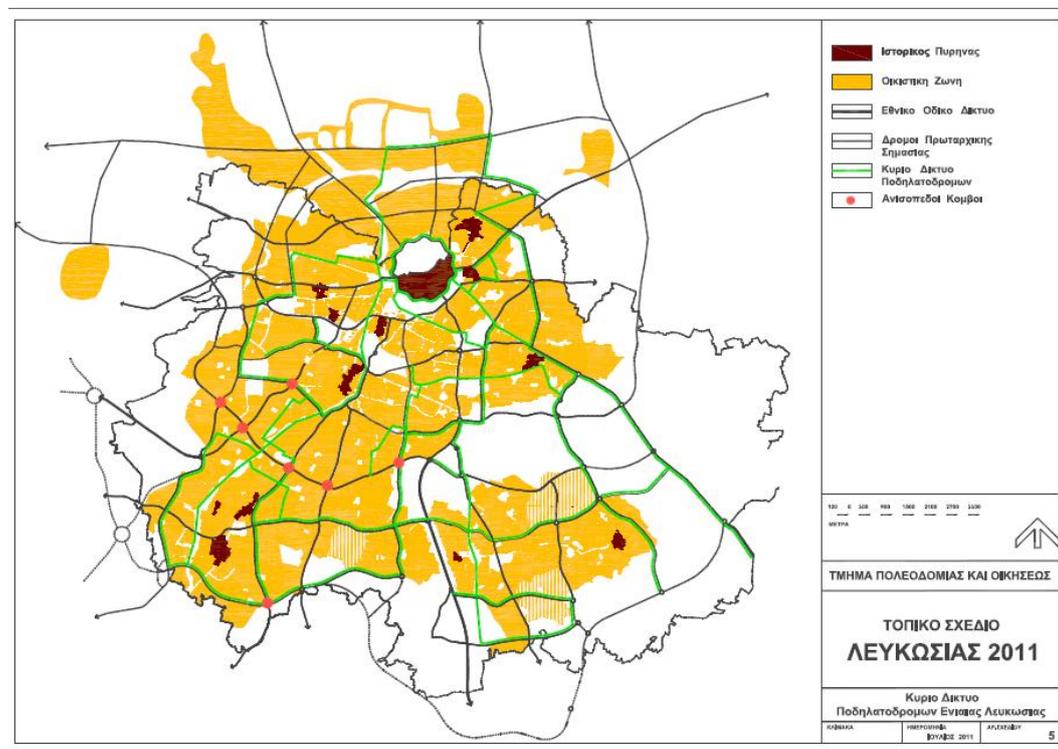


Figure 23. Main Nicosia cycle path network

4.8 Planned works at Strovolos Municipality road network

The following works at Strovolos Municipality road network have been planned:

- Improvement of Tseriou Street: The master plan has been approved and the preparation of construction plans has already begun.
- Road connecting Strovolos and Archangelou Avenues (from the offices of the Department of Public Works to the intersection of Archangelou and Makedonitissas Streets): the preparation of construction plans is in progress.
- Improvement – widening of Archangelos Avenue.

[Source: www.strovolos.org.cy]

4.9 Solid waste production and management at Strovolos Municipality

Regarding the production of household waste at a Municipal and Community level, the available data is for the Nicosia area and relates to the quantities produced in the municipalities and communities of Nicosia, which are driven to the disposal area of Kotsiatis (data up to 1999). This data is available from the Statistical Service of Cyprus and come from measurements made by the Municipality of Nicosia (daily weightings of garbage trucks entering the garbage disposal site for one week). The purpose of these measurements was the calculation of the annual quantity of waste going to the disposal site by the municipalities and communities in order to determine the corresponding disposal fees per Municipality and Community.

Based on the data of Table 4, it seems - as expected- that the quantities of household waste are increasing over time and have almost doubled from 1991 to 1999. This is mainly due to the population increase in Nicosia, the improvement of living standards and the absence of any recycling program.

Table 6. Quantities of household waste driven at the disposal areas in the Nicosia district (tons/year)

Municipalities and wider Nicosia area	1991	1994	1999
Nicosia Municipality	27.361	30.377	36.266
Strovolos Municipality	20.499	24.560	40.522
Egkomi Municipality	4.730	6.544	10.534
Agios 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
Deutera-Anthoupoli Complex	4.472	1.565	2.361
Dhali-Pera Chorio Complex	4.129	3.949	6.900
Lythrodontas Complex	2.444	3.028	3.427
Ergates Complex		1.940	1.970
Kornos Complex		712	1.170
Geri Improvement Board	1.352	1.262	1.716
Klirou Improvement Board	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: Cyprus Statistical Service]

According to data from the Sanitation Division of Public Health and the Strovolos Municipality, there are currently 13 garbage collection crews in the municipality carrying 31,100 tons of garbage annually. Every week about 100 routes are run to Kotsiatis. In addition to the garbage trucks, other trucks run 120 routes for green waste transfer (see 4.11).

4.10 Recycling plan at Strovolos Municipality

- The waste collection program within the boundaries of Strovolos Municipality is carried out by a contractor of the non-profit organization Green Dot Cyprus.
- Within the boundaries of Strovolos Municipality, in addition to the “door-to-door” recycling system, recycling bins have been installed for PMD (blue), paper (brown) and glass, and collection is performed every week in conjunction with collections of the municipal solid wastes. The collection schedule in Strovolos is shown in the image below. Based on this schedule, the Municipality has been divided into three areas and collection is performed weekly on Friday, Saturday and Sunday evening.

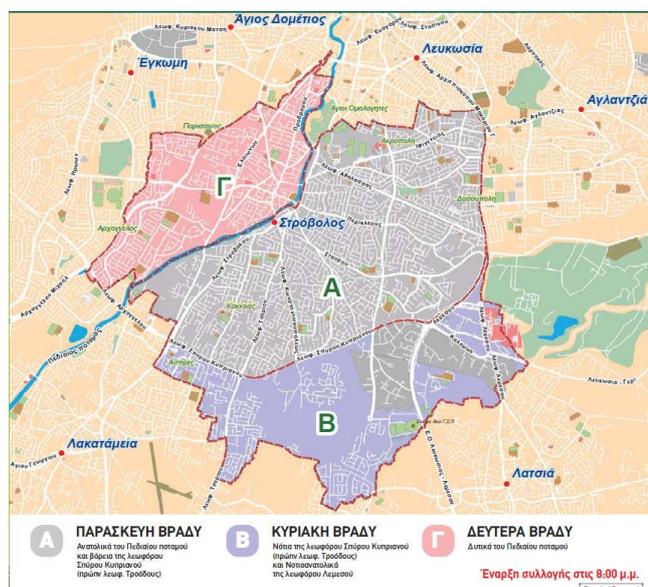


Figure 24. Schedule for recycled waste collection

Green Dot (Cyprus) Public Co Ltd (GDC) was established by the CCCI and a number of respondents package managers on 17 July 2003, as a non-profit organization, in accordance with the provisions of Law 32 (I) / 2002. The creation of GDC stems from the Law 32 (I) / 2002 that establishes the framework and responsibilities of companies liable for packaging and which must ensure the recovery and recycling of packaging.

Meanwhile, the organization is part of the largest global network of packaging collection organizations, the Packaging Recovery Organization Europe which is based in Brussels (PRO EUROPE) and which includes 31 other similar systems around the world (more information about the organization can be found at the website www.pro-e.org). With the above participation, has become the exclusive manager of the Green Dot trademark in Cyprus.

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

4.11 Green wastes

The collection of green wastes such as prunings, grass etc. from public green spaces and parks is performed by the Strovolos Municipality services. High quality geographical information is provided to the municipality citizens through the web application “Pruning Program Collection Strovolos 2011”, which is a digital map service based on GeomaticMaps™, the Strovolos

Municipality data on pruning collection and other municipality data. This service is available at the Strovolos Municipality website www.strovolos.org.cy.

The application provides each citizen the opportunity to obtain geographic information on pruning collection of Strovolos Municipality for the year 2011, for each area of the municipality and for each collection period of pruning. In addition, it provides:

- A search for addresses and points of interest
- A display of a rich set of categories of points of interest (e.g. banks, restaurants, public offices, pharmacies, churches, etc.).
- Communication with Strovolos Municipality for informational purposes and any comments.

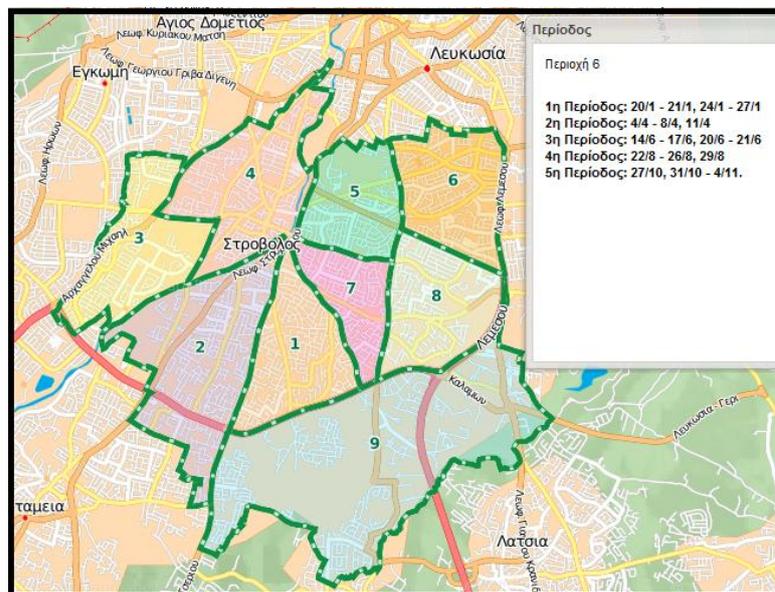


Figure 25. Search example for pruning collection periods for Area 6.

4.12 Strovolos Municipality population

The Municipality has a high growth rate over recent years. Today, the number of citizens of Strovolos Municipality exceeds 67,000.

4.13 Strovolos Municipality participation in other European “energy-related” projects and initiatives

Strovolos Municipality also participates in the following European projects/initiatives related to energy:

<p>The Covenant of Mayors</p> <p>Initiative of the European Commission for creating a permanent co-operation network between European towns and cities against Climate Change.</p> <p>By their commitment, Covenant signatories aim to meet and exceed the European Union 20% CO₂ reduction objective by 2020 through measures promoting Energy Efficiency and Renewable Sources.</p>	 <p>Covenant of Mayors Committed to local sustainable energy</p>	<p>www.eumayors.eu</p>
<p>Medeea</p> <p>The general aim is to reach and go beyond the “20-20-20” EU energy objectives in the Mediterranean regions, through municipal integrated energy planning & activities through the Energy Award-eea[®] tool for energy planning.</p>	 <p>medeea</p>	<p>www.interregmedeea.eu</p>

5. INVENTORY OF ENERGY CONSUMPTION IN STROVOLOS MUNICIPALITY

5.1 Residential Sector

Table 7. Energy demand in MWh in the Residential Sector in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot water	4.424	3.871	276	17.971	138	968	27.648
Heating and cooling	106.168	63.328	7.450	559	373	9.313	187.190
Lighting	5.898	-	-	-	-	-	5.898
Kitchen	4.424	-	1.896	-	-	0	6.320
Electrical devices or appliances	26.542	-	-	-	-	-	26.542
Total	147.455	67.199	9.623	18.530	511	10.281	253.598

5.2 Primary Sector

Table 8. Energy Demand in MWh in the primary sector for the year 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestry, Fishing	1.118	679	-	220	447	2.463
Mining and Quarrying	-	-	-	-	-	-
Total	1.118	679	1.352	220	447	2.463

5.3 Secondary Sector

Table 9. Energy demand in MWh in the secondary sector for the year 2009

Description	Electricity	Fuel oil	LPG	Solar	Biomass	Total
Processing	19.941	12.109	3.916	880	293	37.139
Water supply, sewerage, waste management	750	456	147			1.353
Construction	790	480	155			1.426
Total	21.482	13.045	4.218	880	293	39.918

5.4 Tertiary Sector

Table 10. 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	56.836	34.513	11.160	2.436	812	105.757
Hotels and restaurants	6.849	4.159	1.345	294	98	12.743
Public administration and social security	13.467	8.178	2.644	577	192	25.059
Defence, Justice, Police and Fire station/department	427	259	84	18	6	795
Education	22.706	13.788	4.459	973	324	42.250
Human Health and Social Care	15.112	9.177	2.967	648	216	28.120
Other Services	57.481	34.905	11.287	2.463	821	106.957
Public Lighting	6.809					6.809
Total	179.687	104.979	33.947	7.409	2.470	328.491

5.5 Transport

Table 11. Final energy consumption in MWh in transports for the year 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transports	35	4.158	5.505		9.697
Other passenger transportation services (taxi, tourism, school buses, etc)	0	66.524	80.080		157.696
Commercial ground transportation services and removable services	0	0	0		0
Private Vehicles	0	137.205	181.666		325.249
Total	35	207.887	275.251		492.642

5.6 Total final energy consumption in the Municipality of Strovolos

Table 12. Final energy consumption in MWh for the year 2009

Sector	Electricity	Fuel oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	147.455	67.199	-	-	9.623	18.530	511	10.281	253.598
Primary	1.118	679	-	-	220	-	-	447	2.463
Secondary	21.482	13.045	-	-	4.218	880	-	293	39.918
Tertiary	179.687	104.979	-	-	33.947	7.409	-	2.470	328.491
Transports	35	-	207.887	275.251	-	-	-	9.470	492.642
Total	349.777	185.901	207.887	275.251	48.007	26.819	511	22.960	1.117.112

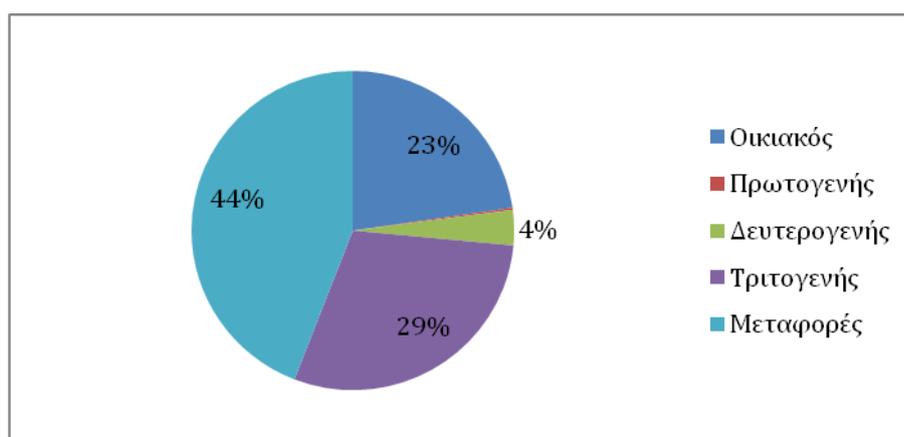


Figure 26. Share of final energy consumption by sector for the year 2009

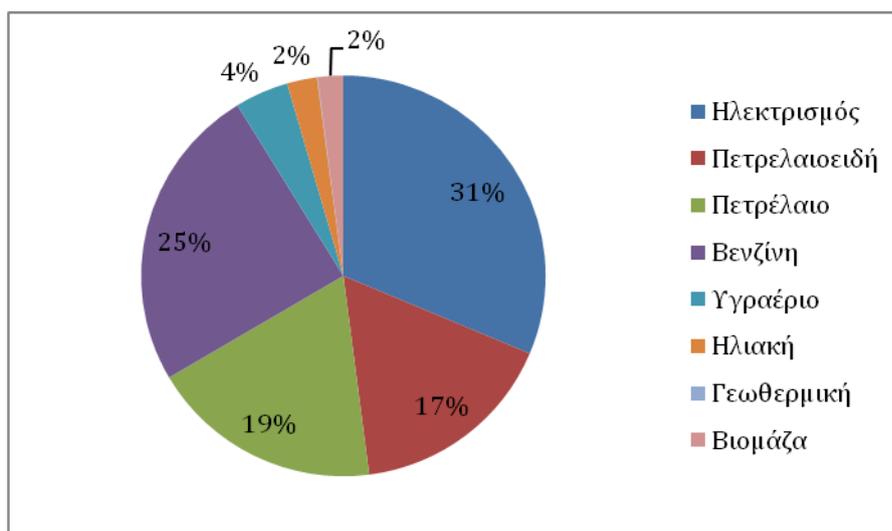


Figure 27. Share of final energy consumption by energy source for the year 2009

6. INVENTORY OF CARBON DIOXIDE (CO₂) EMISSIONS AT STROVOLOS MUNICIPALITY

6.1 Introduction

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

Table 13. Coefficients for calculating CO₂ emissions

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

6.2 Residential Sector

Table 14. CO₂ emissions in tonnes in the residential sector of Strovolos Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot water	3.866	1.080	66	-	-	-	5.013
Heating and Cooling	92.790	17.669	1.788	-	-	-	112.247
Lighting	5.155	-	-	-	-	-	5.155
Kitchen	3.866	-	455	-	-	-	4.321
Electrical devices or appliances	23.198	-	-	-	-	-	23.198
Total	128.876	18.748	2.309	-	-	-	149.934

6.3 Primary Sector

Table 15. CO₂ emissions in tonnes in the primary sector of Strovolos Municipality in 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestry, Fishing	977	189	0	53	-	1.219
Mining and Quarrying	0	0	0	0	-	0
Total	977	189	0	53	-	1.219

6.4 Secondary Sector

Table 16. CO₂ emissions in tonnes in the secondary sector of Strovolos Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Processing	17.429	3.378	940	-	-	21.747
Water supply, sewerage, waste management	656	127	35	-	-	818
Construction	691	134	37	-	-	862
Total	18.775	3.639	1.012	-	-	23.427

6.5 Tertiary Sector

Table 17. CO₂ emissions in tonnes in the tertiary sector of Strovolos Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	49.675	9.629	2.678	-	-	61.982
Hotels and restaurants	5.986	1.160	323	-	-	7.469
Public administration and social security	11.770	2.282	635	-	-	14.689
Defence, Justice, Police and Fire station/department	373	72	20	-	-	466
Education	19.845	3.847	1.070	-	-	24.762
Human Health and Social Care	13.208	2.560	712	-	-	16.481
Other Services	50.238	9.738	2.709	-	-	62.686
Public Lighting	5.951	-	-	-	-	5.951
Total	157.047	29.289	8.147	-	-	194.483

6.6 Transports

Table 18. CO₂ emissions in tonnes for transports in Strovolos Municipality in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transports	30	1.110	1.371	-	2.511
Other passenger transportation services (taxi, tourism, school buses, etc)	-	17.762	21.932	-	39.694
Commercial ground transportation services and mobile services	-	-	-	-	-
Private Vehicles	-	36.634	45.235	-	81.869
Total	30	55.506	68.537	-	124.073

6.7 Total CO₂ emissions in Strovolos Municipality

Table 19. CO₂ emissions in tonnes for Strovolos Municipality transports in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	128.876	18.748	-	-	2.309	-	-	-	149.934
Primary	977	189	-	-	53	-	-	-	1.219
Secondary	18.775	3.639	-	-	1.102	-	-	-	23.427
Tertiary	157.047	29.289	-	-	8.147	-	-	-	194.483
Transports	-	-	55.506	68.537	-	-	-	-	124.073
Total	305.705	51.866	55.506	68.537	11.522	-	-	-	493.136

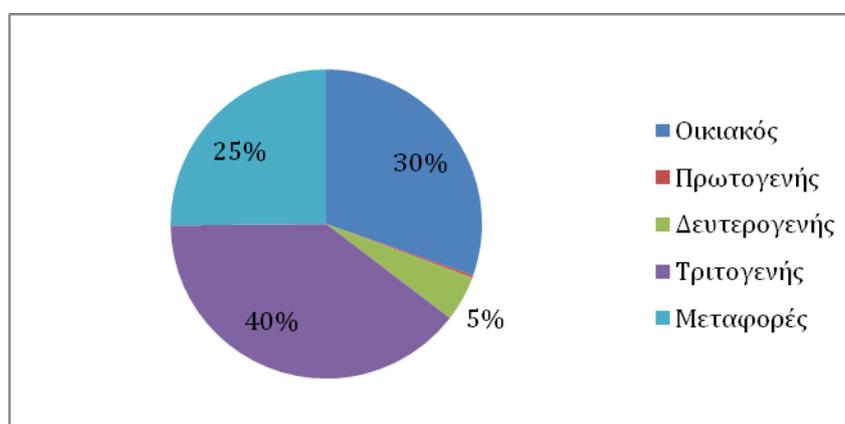


Figure 28. Share of CO₂ emissions by sector in 2009

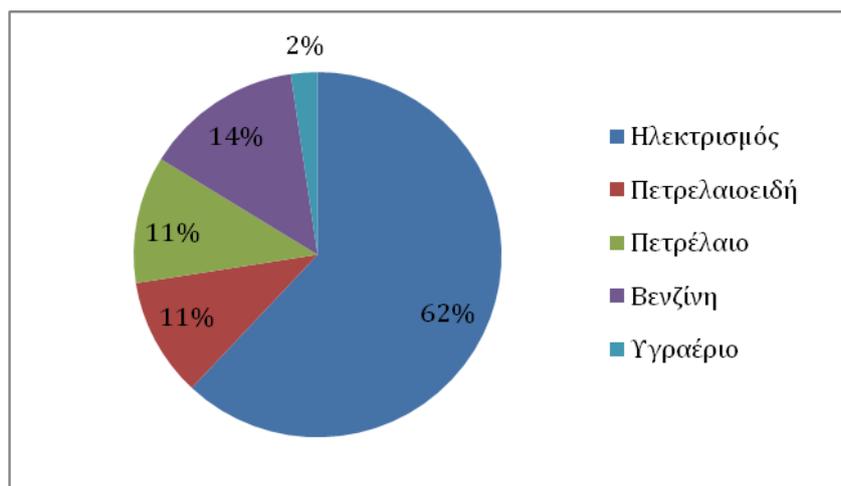


Figure 29. Share of CO₂ emissions by energy source in 2009

6.8 Forecasting/Projection Scenario of CO₂ emissions

For the forecasting/projection of CO₂ emissions in the period 2010 to 2020, a scenario of expected evolution was established, which includes the following main factors:

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 19)
2. Use of annual growth rates of energy efficiency at the end-use due to the improvement of existing technologies (see Table 20)
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 21).
4. The gradual introduction, use and integration of natural gas into the power generating system.

Table 20. Growth rates of energy consumption per consumer used in the expected evolution scenario

Sector description	Estimated annual energy consumption growth rate
Residential	
Hot water	3%
Heating and cooling	3%
Lighting	3%
Cooking	3%
Refrigerators and freezers	3%
Washers and dryers	3%
Dishwashers	3%
Televisions	3%
Other electrical devises/appliances	3%
Primary Sector	
Agriculture, Forestry, Fishing	1,0%
Mining and Quarrying	0,5%
Secondary Sector	

Sector description	Estimated annual energy consumption growth rate
Manufacturing & Processing	3,5%
Water supply, sewerage, waste management and remediation activities	2,5%
Construction	3,0%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	3,0%
Accommodation services activities and food services	3,5%
General administration and social security	2,0%
Defence services and justice, police and fire brigades	1,5%
Education	1,5%
Activities related to Human Health and Social Care	2,0%
Other Services	2,0%
Municipal / Public lighting	3,0%
Transport (vehicles)	
Private transports	2%
Urban and suburban passenger transports	2,0%
Other road passenger 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 21. Increased efficiency in energy end use (reducing the final energy for the same useful energy)

Sector description	Estimated annual growth of efficiency in end use of energy
Residential	
Hot water	0,5%
Heating and Cooling	0,5%
Lighting	0,5%
Cooking	0,5%
Refrigerators and freezers	0,5%
Washers and dryers	0,5%
Dishwashers	0,5%
Televisions	0,5%
Other electrical devises/appliances	0,5%
Other services	0,5%
Municipal / public lighting	0,5%
Transport (vehicles)	

Sector description	Estimated annual growth of efficiency in end use of energy
Private transports	0,5%

Table 22. Coefficient of energy performance for 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 23. Expected evolution scenario for forecasting CO₂ emissions for the period 2009 to 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Increase compared to 2009
2009	352.236	60.736	68.537	11.522	0	493.031	0%
2010	360.925	62.335	70.353	11.804	0	505.416	2%
2011	369.837	63.977	72.217	12.093	0	518.125	5%
2012	378.979	65.665	74.133	12.390	0	531.167	8%
2013	378.324	67.398	76.101	12.694	0	534.517	8%
2014	378.018	69.178	78.123	13.007	0	538.326	9%
2015	378.250	70.774	80.200	13.327	0	542.552	10%
2016	370.468	72.426	82.334	13.656	10.072	548.957	11%
2017	345.332	74.134	84.527	13.994	30.325	548.312	11%
2018	302.410	75.899	86.780	14.340	60.875	540.304	10%
2019	241.258	77.722	89.094	14.695	101.841	524.611	6%
2020	161.418	79.603	91.473	15.060	153.349	500.902	2%

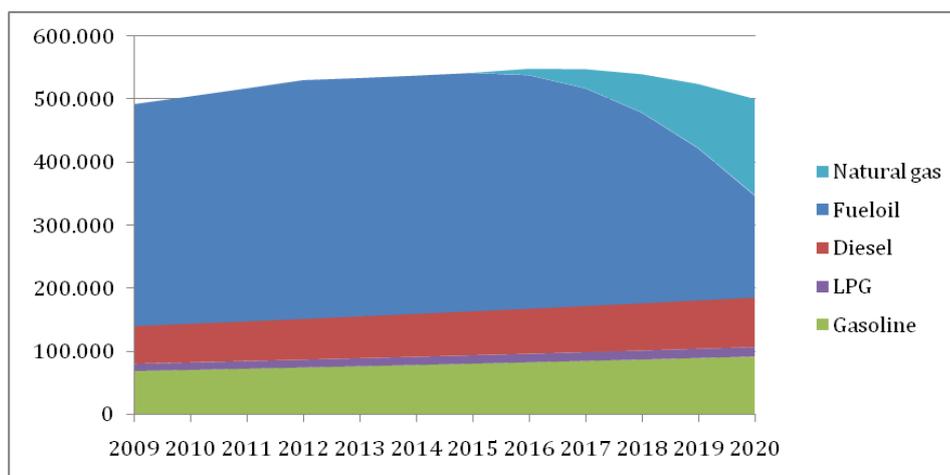


Figure 30. Expected evolution scenario for forecasting CO₂ emissions for the period 2009 to 2020

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

7.1 Introduction

The Sustainable Energy Action Plan that has been prepared for the 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 CO₂ emissions by at least 20% by 2020 compared to the reference year 2009.

Annual base emissions in 2009 (tn CO ₂ /year)	Expected annual emissions in 2020 (tn CO ₂ /year)	Average emissions growth (tn CO ₂ /year)	Minimum emissions target in 2020 (tn CO ₂ /year)	Desired minimum (20%) emissions reduction (tn CO ₂ /year)
493.136	500.902	706	394.509	106.393

Despite estimating and aggregating the contribution of national measures in the Sustainable Energy Action Plan, the achievement of the national goals cannot be determined by the Municipality. 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 key areas:

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

7.2 Energy efficiency in public buildings

Measure: ENERGY EFFICIENCY 1: Thermal insulation in the Town Hall and Theatre

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 offers, (b) evaluation of the offers against 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.

Insulation Measures can receive a subsidy of 30% (by the time of preparation of this report).

Implementation 2010 – 2011

Measure Code	ENEF 1		
Measure Name	Insulation Interventions at the Town Hall and Theatre		
APPLICATION COST			
Investment Cost	Area (m ²)	Cost (€/m ²)	Total (€)
Roof insulation (no subsidy)	3000	15 €/m ² _{roof}	45.000
Operation Cost			
Roof insulation	0 €		
Indirect Cost			
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Heated area (m ²)	Profit (kWh/m ² _{heated area} ·year)	Energy Saving (kWh/year)
Roof insulation	9000	16.7	150.216
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
Roof insulation	150.216	0.13	19.528
Environmental	Emission reduction factor (kgCO ₂ /m ² _{h.a.} ·year)	Heated space (m ²)	Emissions saving (kgCO ₂ /year)
Roof insulation	8.9	9000	80.100
RESULTS – EVALUATION			
Unit Cost (€/kgCO ₂)			Proposed for implementation
Roof insulation	0.56 €/ kgCO₂ annual saving		<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT - ENEF1 Insulation interventions at the Town Hall and Theatre			
Total Cost	Saving	Emissions Reduction	Depreciation
45.000 €	19.528 €	80.100 KgCO₂/ year	2.3 years

Measure: ENERGY EFFICIENCY 2: Improving the energy performance of buildings at Acropolis Park

Roof insulation was examined. The indirect cost of the measure application is not particularly important, as the following requirements must first be fulfilled: (a) preparation of public procurement (call for tenders), (b) evaluation of the offers against 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.

Building Description	
Building area	1200m ²
Uses	Cafe-Restaurant
Energy Consumption	198.0 kWh/year

Insulation Measures receive a subsidy of 30% (by the time of preparation of this report).

Implementation year 2011

Measure Code	ENEF 2		
Measure Name	Improving building energy performance at Acropolis Park		
APPLICATION COST			
Investment Cost	Area (m ²)	Cost (€/m ²)	Total (€)
Roof insulation (no subsidy)	1200	15 €/m ² _{roof}	18.000
Operation Cost			
Roof insulation	0 €		
Indirect Cost			
Roof insulation	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Heated area (m ²)	Profit (kWh/m ² _{heated area} ·year)	Energy Saving (kWh/year)
Roof insulation	1200	35.6	42.734
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
Roof insulation	42.734	0.13	5.555
Environmental	Emission reduction factor (kg _{CO2} /m ² _{h.a.} ·year)	Heated space (m ²)	Emissions saving (kg _{CO2} /year)
Roof insulation	19.1	1200	22.820
RESULTS – EVALUATION			
Unit Cost (€/kgCO ₂)		Proposed for implementation	
Roof insulation	0.79 €/ kgCO₂ annual saving	<input checked="" type="checkbox"/>	
MEASURE TO IMPLEMENT – ENEF2 Roof insulation at Acropolis Park building			
Total Cost	Saving	Emissions Reduction	Depreciation
18.000 €	5.555 €	22.820 Kg_{CO2}/ year	3.2 years

Measure: ENERGY EFFICIENCY 3: Electricity saving in the Town Hall Building

The following were examined: (a) Installation of a voltage regulator and (b) Replacement of conventional lamps.

Building description

Energy Consumption 696.000 kWh/year

The indirect cost of the measure application is not particularly important, as the following requirements must first be fulfilled: (a) preparation of terms for receiving offers, (b) evaluation of the offers against 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.

Saving Systems receive a subsidy of 30% (by the time of preparation of this report).

Implementation year 2011

Measure Code	ENE3		
Measure Name	Electricity Saving in the Building of Town Hall		
APPLICATION COST			
Investment Cost	Total (€)		
(a) Voltage Regulator (no subsidy)	46.000		
(b) Lamp Replacement (no subsidy)	1.500		
Operation Cost			
(a) Voltage Regulator	0 €		
(b) Lamp Replacement	0 €		
Indirect Cost			
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Area (m ²)	Profit (kWh/m ² .year)	Energy saving (kWh/year)
(a) Voltage Regulator	9.500	7.3	69.350
(b) Lamp Replacement	9.500	1.5	14.250
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
(a) Voltage Regulator	69350	0.13	9015
(b) Lamp Replacement	14.250	0.13	1852
Environmental	Emission reduction factor (kg _{CO2} /m ² .year)	Area (m ²)	Emissions saving (kg _{CO2} /year)
(a) Voltage Regulator	5.78	9500	54.910
(b) Lamp Replacement	1.16	9500	11.020
RESULTS – EVALUATION			
Unit Cost (€/kgCO ₂)			Proposed for implementation
(a) Voltage Regulator	0.84 €/ kg_{CO2} annual saving		<input checked="" type="checkbox"/>
(b) Lamp Replacement	0.14 €/ kg_{CO2} annual saving		<input checked="" type="checkbox"/>

MEASURE TO IMPLEMENT – ENEF3 Electricity Saving in the Town Hall			
Total Cost 47.500 €	Saving 10.867 €	Emissions Reduction 65.930 Kg _{CO2} / year	Depreciation 4.4 years

Measure: ENERGY EFFICIENCY 4: Renewable Electricity from Photovoltaics at Acropolis Park Building

The installation of an electricity generating system with Photovoltaics panels was examined. The total power from the PV installation will be 20 kW and will cover an area approximately 200 m².

The indirect cost of the measure application is not particularly important, as the following requirements must first be fulfilled: (a) preparation of terms for receiving offers, (b) evaluation of the offers against 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. In addition, the process of connecting the PV panels with the electricity network grid of EAC should be performed.

Photovoltaic Systems receive a subsidy of 0% and the subsidized kWh price is €0,31 (by the time of preparation of this report).

Implementation 2012

Measure Code	ENEf 4		
Measure Name	Renewable Electricity from Photovoltaics at Acropolis Park		
APPLICATION COST			
Investment Cost	Total (€)		
<i>Photovoltaic System 20 kW (no subsidy)</i>	44.000		
Operation Cost			
<i>Photovoltaic System 20 kW</i>	0 € (negligible cost for periodic module cleaning)		
Indirect Cost			
	<input type="checkbox"/> - High <input checked="" type="checkbox"/> - Medium <input type="checkbox"/> - Low		
APPLICATION BENEFIT			
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	Green Energy (kWh/year)
<i>Photovoltaic System 20 kW</i>	20	1500	30.000
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	Income (€/year)
<i>Photovoltaic System 20 kW</i>	30.000	0.31	9.300
Environmental	Emission Reduction factor (kg _{CO2} /kW.year)	Power (kW)	Emissions saving (kg_{CO2}/ year)
<i>Photovoltaic System 20 kW</i>	1.183	20	23.670
RESULTS – EVALUATION			
Unit Cost (€/kgCO ₂)		Proposed for implementation	
<i>Photovoltaic System 20 kW</i>	1,86 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>	
MEASURE TO IMPLEMENT – ENEF4 Renewable Electricity from Photovoltaics at Acropolis Park			
Total Cost	Income	Emissions Reduction	Depreciation
44.000 €	9.300 €	23.670 Kg_{CO2}/ year	4,7 years

Measure: ENERGY EFFICIENCY 5: Renewable Electricity from Photovoltaics at the warehouses building of Municipality

The installation of an electricity generating system with Photovoltaics panels was examined. The total power from the PV installation will be 20 kW and will cover an area of approximately 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 offers against 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. In addition, the process of connecting the PV panels with the electricity network grid of EAC should be performed.

Photovoltaic Systems receive a subsidy of 0% and the subsidized kWh price is €0,31 (by the time of preparation of this report).

Implementation 2012

Measure Code	ENE5		
Measure Name	Renewable Electricity from Photovoltaics at the warehouses building		
APPLICATION COST			
Investment Cost	Total (€)		
<i>Photovoltaic System 20kW (no subsidy)</i>	44.000		
Operation Cost			
<i>Photovoltaic System 20kW</i>	0 € (negligible cost for periodic module cleaning)		
Indirect Cost			
	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Medium <input type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	Green Energy (kWh/year)
<i>Photovoltaic System 20kW</i>	20	1500	30.000
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	Income (€/year)
<i>Photovoltaic System 20kW</i>	30.000	0.31	9.300
Environmental	Emission Reduction factor (kgCO ₂ /kW.year)	Power (kW)	Emissions saving (kgCO₂/year)
<i>Photovoltaic System 20kW</i>	1.183	20	23.670
RESULTS - EVALUATION			
Unit Cost (€/kgCO ₂)	1.86 €/ kgCO₂ annual saving		Proposed for implementation <input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT - EE5 Renewable Electricity from Photovoltaics at the warehouses building			
Total Cost 44.000 €	Income 9.300 €	Emissions Reduction 23.670 KgCO ₂ / year	Depreciation 4,7 years

Measure: ENERGY EFFICIENCY 6: Establishment of Culture Centre with energy planning

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

Start of Implementation 2013

Measure Code	ENEF6		
Measure Name	Establishment of Culture Centre with energy planning		
APPLICATION COST			
Investment Cost	Total (€)		
	464.000		
Indirect Cost			
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Energy Saving (kWh/year)		
	150.000		
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
	150.000	0.13	19.500
Environmental	Emissions reduction factor (kg _{CO2} /KWh)	Emissions Saving (kg_{CO2}/ year)	
	0,789	118.350	
RESULTS – EVALUATION			
Unit Cost (€/kgCO ₂)	3,92 €/ kg _{CO2} annual saving		Proposed for Implementation
			<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT ENEF6 – Establishment of Culture Centre with energy planning			
Total Cost	Saving	Emissions Reduction	
464.000 €	19.500 €	118.350 Kg_{CO2}/ year	

7.3 Energy saving through awareness raising campaigns

Measure: AWARENESS RAISING CAMPAIGNS 1: Organization of an annual seminar on Renewable Energy Sources

The organization of an annual seminar on Renewable Energy Sources in Strovolos Municipality was examined. The full-day seminar will be held at the Municipal Hall annually for a total of 3 years.

The application of this measure can be considered to have a high indirect cost as, apart from the organization of the seminar (speakers, invitations, location, catering, etc), the interested party must bear their own costs of implementing renewable energy technologies at home.

Implementation 11-12 of March 2011

Measure Code	ESAC1	
Measure Name	Organization of annual seminar on RES	
APPLICATION COST		
Measure Cost	3.000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	540.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit is for those concerned	
Environmental (kgCO ₂ -eq)	526.060 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.006€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$

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:

$ES= 200*3*0.3*3*1000kWh/year= 540.000 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 2: Organization of annual seminar on Energy Saving

The organization of an annual seminar on Energy Saving in Strovolos Municipality was examined. The full-day seminar will be held at the Municipal Hall annually for a total of 3 years.

The application of this measure can be considered to have a high indirect cost as, apart from the organization of the seminar (speakers, invitations, location, catering, etc), the interested party should bear their own costs of implementing energy saving measures at home.

Implementation 11-12 March 2011

Measure Code	ESAC2	
Measure Name	Organization of annual seminar on energy saving	
APPLICATION COST		
Measure Cost	3.000 €	
Indirect Cost	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	504.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	326.135 kg _{CO2} /year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.009€/ kg _{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
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: $ES= 200*3*0.4*3*700kWh/year= 504.000 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 3: Organizing a day of «Renewable Energy Sources and Energy Saving»

The organization of an annual day of Renewable Energy Sources and Energy Saving in Strovolos 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, beyond the event organization, the interested party should bear their own costs of implementing energy saving measures or renewable energy sources at home.

Implementation of March 12, 2011 (every year)

Measure Code	ARC3	
Measure Name	Organizing days of Renewable Energy Sources and Energy Saving	
APPLICATION COST		
Measure Cost	10.000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	6.144.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	4.734.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.002€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
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: $ES= 640*10*0.4*3*800kWh/year= 6.144.000 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 4: Organization of educational presentations to students

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

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

Start of Implementation: 2010

Measure Code	ESAC4	
Measure Name	Organization of educational presentations to students	
APPLICATION COST		
Measure Cost	1.800 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	2.016.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	1.000.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.002€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

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

Measure: AWARENESS RAISING CAMPAIGNS 5 – Organization of day without lighting

The organization of an annual day without lighting in Strovolos Municipality was examined. The measure will be effective for a period of 10 years.

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

Implementation 30 March, 2011 (annually)

Measure Code	ARC5	
Measure Name	Organization of days without lighting	
APPLICATION COST		
Measure Cost	5000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	3.600.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	2.329.537 kgCO₂/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.002€/ kgCO₂ annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

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

Measure: AWARENESS RAISING CAMPAIGNS 6: Information about energy in the Municipality website and newspaper

The posting of information on RES and ES in the Municipality of Strovolos website was examined. In addition, there will be a special article on energy in the Municipality quarterly newspaper. The measure would have a period of 10 years.

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

Start of Implementation: 2010

Measure Code	ESAC6	
Measure Name	Information about energy in the Municipality website and newspaper	
APPLICATION COST		
Measure Cost	0 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	4.100.000 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	2.000.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.00 €/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

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

Measure: AWARENESS RAISING CAMPAIGNS 7: Free consulting services from the Municipality to its citizens

The ability to service the citizens with consultancy services by an employee of the Municipality was examined. The measure would have a period of 3 years.

The indirect cost of the measure application can be considered as high as the interested party should bear their own costs of implementing energy saving measures or renewable energy sources at home. It is expected that less people will be interested in this measure compared to participation in other events.

Measure Code	ESAC7	
Measure Name	Free consulting services from the Municipality to its citizens	
APPLICATION COST		
Measure Cost	18.000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	3.098.250 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned	
Environmental (kgCO ₂ -eq)	1.555.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.011 €/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

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

Measure: AWARENESS RAISING CAMPAIGNS 8: Organization of Cycling days

The organization of an annual Cycling day in Strovolos Municipality was examined. The measure would have a period of 10 years.

The indirect cost of the measure application can be considered as low as, apart from organizing the event, there will be no participation cost for the interested party.

Start of implementation: September 2010

Measure Code	ESAC8	
Measure Name	Organization days of bicycle motion	
APPLICATION COST		
Measure Cost	2000 €	
Indirect Cost	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	994.680 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned stems from fuel saving	
Environmental (kgCO ₂ -eq)	258.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.008€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
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: AWARENESS RAISING CAMPAIGNS 9: Organization of eco-cars days

The organization of an annual day of eco-cars in Strovolos Municipality was examined. The measure would apply for 9 years.

The indirect cost of the measure application 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 2011

Measure Code	ESAC9	
Measure Name	Organization days of eco-cars	
APPLICATION COST		
Measure Cost	4500 €	
Indirect Cost	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	1.243.350 kWh/year	
Financial (Green energy. €/year)	The economic benefit for those concerned stems from fuel saving	
Environmental (kgCO ₂ -eq)	321.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.014€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
ES: Energy Saving (kWh) v: participation number ε: Application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: $ES= 100*9*0.05*3*9210kWh/year= 1.243.350 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 10: Information and public awareness through leaflets and information messages

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

The indirect cost of the measure application can be considered as high as apart from leaflets preparation and distribution, the interested party (to be aware) should bear their own any investment or savings.

Measure Code	ESAC10			
Measure Name	Leaflets and information messages			
APPLICATION COST				
Measure Cost	Total (€)			
(a) Leaflets for RES and ES	10.000 €			
(b) Leaflets for sustainable mobility	10.000 €			
(c) Articles in the newspaper of the Municipality	0 €			
(d) TV Spot	5000 €			
(e) Radio Spot	3000 €			
Indirect Cost				
	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low			
APPLICATION BENEFIT				
Energy	Number/Recipients	Percentage of awareness	Energy Profit (kWh/person.year)	Energy Saving (kWh/year)
(a) Leaflets for RES and ES	50.000	5%	1100	2.750.000
(b) Leaflets for sustainable mobility	50.000	5%	2210	5.526.000
(c) Articles in the newspaper of the Municipality	100.000	2%	900	1.800.000
(d) TV Spot	10.000	4%	1100	440.000
(e) Radio Spot	10.000	3%	1000	300.000
Financial				
	The economic benefit for those concerned stems from energy saving			
Environmental	Emissions Saving (kg_{CO2}/ year)			
(a) Leaflets for RES and ES	1.779.507			
(b) Leaflets for sustainable mobility	1.395.868			
(c) Articles in the newspaper of the Municipality	1.164.768			
(d) TV Spot	286.640			

(e) Radio Spot	194.128	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)		Proposed for Implementation
(a) Leaflets for RES and ES	0.006 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(b) Leaflets for sustainable mobility	0.007 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(c) Articles in the newspaper of the Municipality	0 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(d) TV Spot	0.009 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(e) Radio Spot	0.008 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT ESAC 10 Leaflets and information messages		
Total Cost 28.000 €	Emissions reduction 4.820.911 Kg_{CO2}/ year	

Measure: AWARENESS RAISING CAMPAIGNS 11: Organization of annual seminar for energy saving in Industry

The organization of an annual seminar on saving energy in industry in Strovolos Municipality was examined. The seminar will be held all day at the Town Hall for 3 years.

The indirect cost of the measure application can be considered as high as apart the seminar organization (speakers, invitations, place, catering, etc), the interested party should bear their own costs of implementing energy saving measures in industry.

Implementation: 2013-2015

Measure Code	ESAC11	
Measure Name	Organization of annual seminar for energy saving in Industry.	
APPLICATION COST		
Measure Cost	3.000 €	
Indirect Cost	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	1.512.000 kWh/year	
Financial (Energy saving. €/year)	The economic benefit for those concerned	
Environmental(kgCO ₂ -eq)	1.184.000 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.003€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
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 : $ES= 70*3*0.8*1.5*6000kWh/year= 1.512.000 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 12: Organization of eco-driving seminar

The organization of an annual seminar on eco-driving in Strovolos Municipality was examined. The measure would be applied for 9 years

The indirect application cost can be considered low

Start of Implementation: June of 2011

Measure Code	ESAC12	
Measure Name	Organization of eco driving days	
APPLICATION COST		
Measure Cost	1000 €	
Indirect Cost	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	20.250 kWh/year	
Financial (Energy saving. €/year)	The economic benefit for those concerned stems from fuel saving	
Environmental(kgCO ₂ -eq)	5.123kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.2€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$
ES: Energy Saving (kWh) v: participation number ε: Application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: $ES= 100*9*0.05*3*150kWh/year= 20.250 kWh/year$

Measure: AWARENESS RAISING CAMPAIGNS 13 – Organization of annual lecture to the residents

The organization of an annual lecture to the residents on renewable energy sources and energy saving was examined. The measure will apply for 8 years.

The indirect cost of the measure application can be considered as high as apart from the lecture organization, the interested party (to be aware) should bear their own costs of investments in renewable energy sources or energy saving.

Start of Implementation: June of 2012

Measure Code	ESAC13	
Measure Name	Organization of annual lecture to the citizens	
APPLICATION COST		
Measure Cost	6000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Medium <input type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	1.200.000 kWh/year	
Financial (Energy saving. €/year)	The economic benefit for those concerned stems from fuel saving	
Environmental(kgCO ₂ -eq)	309.808 kg_{CO2}/year	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)	0.014€/ kg_{CO2} annualsaving	Proposed for Implementation <input checked="" type="checkbox"/>

Equation: $ES=v*\epsilon*n*v\delta*ESPP$		
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:		
$ES= 200*8*0.05*3*5000kWh/year= 1.200.000 kWh/year$		

7.4 Energy Savings in Transport

Measure: EST1 – ENERGY SAVING IN TRANSPORT Energy Saving in transports by promoting eco-cars (hybrid and electric)

The possibility of promoting vehicles with low CO₂ emissions through facilities provision was examined. Two cases were examined (a) free parking and (b) electric vehicle charging points. The application period is for 5 years. The indirect cost of the measure application can be considered as limited as the interested party (to be aware of eco-car market) should bear their own cost of purchase an eco-car.

Measure Code	EST1			
Measure Name	Cars promotion with low CO₂ emissions			
APPLICATION COST				
Measure Cost	Total (€)			
<i>(a) Free parking (20 positions)</i>	70.000 € *loss of revenue			
<i>(b) Charging Points of Electric Vehicles (5 positions)</i>	2500 €			
Indirect Cost				
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low			
APPLICATION BENEFIT				
Energy	Number of position	Traffic (5 years)	ES per visit& ES by diffuse information (kWh/ year)	Energy Saving (kWh/year)
<i>(a) Free parking (10 positions)</i>	20	73.000	70	5.110.000
<i>(b) Charging Points of Electric Vehicles (5 positions)</i>	5	18.250	80	1.460.000
Financial				
	The economic benefit for those concerned stems from energy saving			
Environmental	Emissions saving (kg _{CO2} / year)			
<i>(a) Free parking (20 positions)</i>	1.290.786			
<i>(b) Charging Points of Electric Vehicles (5 positions)</i>	368.796			
RESULTS – EVALUATION				
Unit Cost (€/kgCO ₂)				Proposed for Implementation
<i>(a) Free parking (20 positions)</i>	0.054 €/ kg _{CO2} annual saving			<input checked="" type="checkbox"/>
<i>(b) Charging Points of Electric Vehicles (5 positions)</i>	0.007 €/ kg _{CO2} annual saving			<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT EST 1 Cars promotion with low CO₂ emissions				
Total Cost	Emissions Reduction			
72.500 €	1.659.582 Kg _{CO2} / year			

Measure: EST2 – ENERGY SAVING IN TRANSPORT: Energy saving in the Municipality’s fleet

The possibility of purchasing to vehicles with low CO₂ was examined.

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 Code	EST2	
Measure Name	Energy saving in the Municipality’s fleet	
APPLICATION COST		
Measure Cost	Total (€)	
<i>Purchase of 5 eco cars</i>	60.000 €	
Indirect Cost		
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	Energy Saving (kWh/year)	
<i>Purchase of 5 eco cars</i>	46.050	
Financial	Saving (€/year)	
<i>Purchase of 5 eco cars</i>	5000	
Environment	Emissions saving (kg_{CO2}/ year)	
<i>Purchase of 5 eco cars</i>	11.632	
RESULTS – EVALUATION		
Unit Cost (€/kgCO ₂)		Proposed for Implementation
<i>Purchase of 5 eco cars</i>	5.158 €/ kg_{CO2} annualsaving	<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT EST2 Energy saving in the Municipality’s fleet		
Total Cost	Emissions Reduction	
60.000 €	11.632 Kg_{CO2}/ year	

Measure: EST3 – ENERGY SAVING IN TRANSPORT: Saving energy in transport by promoting bicycle use (bicycle rental system)

The possibility of promoting bicycle use by installing a bicycle rental system was examined. The bicycle rental system will operate in collaboration with Municipalities of Nicosia District or other private (touristic) companies. The application period is for 10 years starting in 2011.

The indirect cost of the measure application can be considered as limited as the interested party (to be aware of bicycle use) should bear the minimal cost of renting bicycles.

Measure Code	EST3			
Measure Name	Bicycle Sharing System			
APPLICATION COST				
Measure Cost	Total (€)			
5 positions and 100 bicycles	200.000 €			
Indirect Cost				
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low			
APPLICATION BENEFIT				
Energy	Number of bicycles	Traffic per year	ES per bicycle & ES by diffused information (kWh/ year)	Energy Saving (kWh/year)
5 positions and 100	100	1095	40	4.380.000
Financial	The economic benefit for those concerned stems from fuel saving			
Environmental	Emissions Saving (kg_{CO2}/ year)			
5 positions and 100 bicycles	1.106.388			
RESULTS - -EVALUATION				
Unit Cost (€/kgCO ₂)				Proposed for Implementation
5 positions and 100 bicycles	0.18 €/ kg_{CO2} annual saving			<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT EST3 Bicycle Sharing System				
Total Cost	Emissions Reduction			
200.000 €	1.106 Kg_{CO2}/ year			

Measure: EST4 – ENERGY SAVING IN TRANSPORT: Upgrade bicycle paths network in Strovolos Municipality

The possibility of bicycle promoting by upgrading the existing network of bicycle paths was examined. The application period is for 6 years starting in 2014.

The indirect cost of the measure application can be considered limited.

Measure Code	EST4			
Measure Name	Upgrade bicycle paths network			
APPLICATION COST				
Measure Cost	Total (€)			
<i>Upgrade bicycle paths network</i>	100.000 €			
Indirect Cost				
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low			
APPLICATION BENEFIT				
Energy	New bicycle paths (km)	Traffic per year (No. of routes)	ES per km & ES by diffuse information (kWh/ year)	Energy Saving (kWh/year)
<i>Upgrade bicycle paths network</i>	10	73.000	20	14.600.000
Financial				
	The economic benefit for those concerned stems from fuel saving			
Environmental	Emissions Saving (kg_{CO2}/ year)			
<i>Upgrade bicycle paths network</i>	3.687.960			
RESULTS - -EVALUATION				
Unit Cost(€/kgCO ₂)				Proposed for Implementation
<i>Upgrade bicycle paths network</i>	0.03 €/ kg_{CO2} annual saving			<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT EST4 Upgrade bicycle paths network				
Total Cost	100.000 €		Emissions Reduction	
			3.687.960kg_{CO2}/ year	

Measure: EST5 – ENERGY SAVING IN TRANSPORT: Optimization of vehicle routes of the Municipality

The possibility of optimizing vehicle routes of the Municipality was examined. The application period is for 9 years starting in 2011.

The indirect cost of the measure application can be considered limited.

Measure Code	EST5	
Measure Name	Optimization of vehicle routes	
APPLICATION COST		
Measure Cost	Total (€)	
Optimization of vehicle routes of the Municipality	10.000 €	
Indirect Cost		
	<input type="checkbox"/> – High <input type="checkbox"/> –Medium <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFIT		
Energy	Energy Saving (kWh/year)	
Optimization of vehicle routes of the Municipality	100.000	
Financial	Saving (€/year)	
	10.858	
Environmental	Emissions Saving	
	26.700	
RESULTS - -EVALUATION		
Unit Cost (€/kgCO ₂)		Proposed for Implementation
	0,375 €/ kg _{CO2} annualsaving	<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT EST5 Optimization of vehicle routes		
Total Cost	Emissions Reduction	
10.000 €	26.700 Kg _{CO2} / year	

7.5 Energy saving in street lighting

Measure: ESSL1 – ENERGY SAVING IN STREET LIGHTING

The possibility of saving energy in street lighting was examined. The street lighting is one of the major costs of the Municipality. The electricity consumption of the street lighting in Strovolos Municipality in 2009 was 6.348.000kWh.

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

Implementation of the measure in 2013

The indirect cost of the measure application can be considered limited.

Measure Code	ESSL1			
Measure Name	Energy saving in street lighting			
APPLICATION COST				
Measure Cost	Total (€)			
<i>(a) Lamp replacement with LED</i>	1.600.000 €			
<i>(b) Optimization of street lighting function</i>	8.000 €			
Indirect Cost				
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low			
Maintenance Cost				
	<input type="checkbox"/> – High <input type="checkbox"/> –Medium <input checked="" type="checkbox"/> – Low			
APPLICATION BENEFIT				
Energy	Number	Electricity Consumption per lamp (kWh/year)	ES per lamp per year (%)	Energy Saving (kWh/year)
<i>(a) Lamp replacement with LED</i>	8000	800	50	3.200.000
<i>(b) Optimization of street lighting function</i>	8000	800	5	320.000
Financial	Energy Saving (kWh/year)	Average price of electricity (€/kWh)	Saving (€/year)	
<i>(a) Lamp replacement with LED</i>	3.200.000	0.13	416.000	
<i>(b) Optimization of street lighting function</i>	320.000	0.13	41.600	
Environmental	Emissions Saving (kgCO₂/ year)			
<i>(a) Lamp replacement with LED</i>	2.524.800			
<i>(b) Optimization of street lighting function</i>	252.480			
RESULTS – EVALUATION				
Unit Cost (€/kgCO ₂)				Proposed for Implementation
<i>(a) Lamp replacement with LED</i>	0.500 €/ kgCO₂ annual saving	<input checked="" type="checkbox"/>		
<i>(b) Optimization of street lighting function</i>	0.0250 €/ kgCO₂ annual saving	<input checked="" type="checkbox"/>		

MEASURE TO IMPLEMENT ESSL1 Energy saving in street lighting			
Total Cost 1.608.000 €	Saving 457.600 €	Emissions Reduction 2.777.280 Kg_{CO2}/ year	Depreciation 3.51 year

7.6 Investments of Strovolos Municipality in RES

Measure: RES1 –RENEWABLE ELECTRICITY: Municipality Investments in Renewable Electricity

The installation of two Photovoltaics Parks was examined. The indirect cost of the measure application is not particularly important, as the following requirements must be fulfilled (a) preparation of call for tenders (b) evaluation of the offers against 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. In addition, the process of connecting the PV panels with the electricity network grid of EAC should be performed.

Photovoltaics systems (Parks) receive a subsidy on the sold kWh (sale price €0,31) by the time of preparation of this report.

Measure Code	RES1		
Measure Name	Renewable Electricity by Photovoltaics		
APPLICATION COST			
Investment cost	Total (€)		
2 x Photovoltaic Park 150 kW	600.000		
Operational cost			
2 x Photovoltaic Park 150 kW	0 € (negligible cost for periodic module cleaning)		
Indirect Cost			
	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Medium <input type="checkbox"/> – Low		
APPLICATION BENEFIT			
Energy	Power (kW)	Electricity generation (kWh/kW.year)	Green Energy (kWh/year)
2 x Photovoltaic Park 150 kW	300	1500	450.000
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	Income (€/year)
2 x Photovoltaic Park 150 kW	450.000	0.31	139.500
Environmental	Emissions Saving (kgCO₂/ year)		
2 x Photovoltaic Park 150 kW	355.050		
RESULTS - -EVALUATION			
Unit Cost (€/kgCO ₂)		Proposed for Implementation	
2 x Photovoltaic Park 150 kW	1,690 €/ kgCO₂ annual saving	<input checked="" type="checkbox"/>	
MEASURE TO IMPLEMENT RES 1 Renewable Electricity by Photovoltaics			
Total Cost 600.000 €	Income 139.500 €	Emissions Reduction 355.050kgCO ₂ / year	Repayment/Depreciation 4,43 year

7.7 Development of green spaces in Strovolos Municipality

Measure: DGS1 – DEVELOPMENT OF GREEN SPACES Development of green spaces in Strovolos Municipality

Was examined: (a) trees planting, (b) care of green spaces

The indirect cost of the measure application can be considered limited

Measure Code	DGS1	
Measure Name	Development of green spaces in Strovolos Municipality	
APPLICATION COST		
Measure Cost	Total (€)	
<i>(a) Tree Planting (2000 trees)</i>	3000 €	
<i>(b) Care of green spaces</i>	8000 €	
Indirect Cost		
	<input type="checkbox"/> – High <input type="checkbox"/> – Medium <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFIT		
Environmental	Emissions Saving (kg _{CO2} / year)	
<i>(a) Tree Planting (2000 trees)</i>	60.000	
<i>(b) Care of green spaces</i>	30.000	
RESULTS - -EVALUATION		
Unit Cost (€/kgCO ₂)		Proposed for Implementation
<i>(a) Tree Planting (2000 trees)</i>	0.05 €/ kg _{CO2} annual saving	<input checked="" type="checkbox"/>
<i>(b) Care of green spaces</i>	0.26 €/ kg _{CO2} annual saving	<input checked="" type="checkbox"/>
MEASURE TO IMPLEMENT DGS1 Development of green spaces in Strovolos Municipality		
Total Cost 11.000 €	Emissions Reduction 90.000 Kg _{CO2} / year	

7.8 Summary of proposed measures at Strovolos Municipality

The Table below demonstrates all the measures proposed to be taken by the Strovolos Municipality and have been included in the Sustainable Energy Action Plan.

Table 24 Summary of the proposed measures

Measure / Action	Application	Cost (€)	Emissions Reduction (Kg _{CO2} / year)	Depreciation /Repayment
Energy Saving in public buildings				
EE1 - Interventions of insulation	2012-2015	45.000	80.100	2.3years
EE2 – Improvement of thermal behaviour of the building of Acropolis park	2011	18.000	22.820	3.2 years
EE3 (a) - Installation of voltage regulator	2011	46.000	54.910	5years
EE3 (b) - Lamp replacement	2011	1.500	11.020	0,8 years
EE4: Renewable electricity by Photovoltaics in Municipality buildings	2012	44.000	23.670	7 years
EE5: Renewable electricity by Photovoltaics in Municipality warehouses	2012	44.000	23.670	7 years
EE6 – Establishment of Culture Centre with energy planning	2013	464.000	118.350	-
Energy Saving through awareness raising campaigns				
ARC 1 – Organizing an annual seminar on Renewable Energy Sources	2011-2013	3.000	526.060	-
ARC 2 - Organizing an annual seminar on energy saving	2011-2013	3.000	326.135	-
ARC 3 - Organizing an annual seminar on Renewable Energy Sources and energy saving	2010-2020	10.000	4.734.000	-
ARC 4 – Organization of educational presentations to students	2010-2020	1.800	1.000.000	-
ARC 5 – Organizing days without lighting	2012-2020	5.000	2.329.537	-

Measure / Action	Application	Cost (€)	Emissions Reduction (Kg _{CO2} / year)	Depreciation /Repayment
ARC 6 - Information about energy in the website and newspaper of the Municipality	2010-2020	0	2.000.000	-
ARC 7 – Free counselling services by the Municipality to its residents	2012-2014	18.000	1.555.000	
ARC 8 - Organization bicycle motion days	2012-2020	2.000	258.000	-
ARC 9 – Organization of eco-cars days	2011-2020	4.500	321.000	-
ARC 10 – Information, Awareness with leaflets and information messages	2012-2020	28.000	4.820.911	-
ARC 11 – Organizing an annual seminar on Energy Saving in Industry	2013-2015	3.000	1.184.000	-
ARC 12 – Organizing an annual seminar on eco-driving	2011-2020	1.000	5.123	
ARC 13 – Organizing an annual lecture to residents	2012-2020	6000	309.808	
Energy Saving in transport				
EST 1: Saving Energy in transport by promoting eco-friendly cars (hybrid and electrical)	2012-2017	72.500	1.659.582	-
EST 2: Saving Energy in the Municipality fleet	2013-2020	60.000	11.632	-
EST 3: Saving Energy in transport by promoting bicycle use (bicycle rental system)	2014-2020	200.000	1.106	-
EST 4: Saving energy in transport by upgrading the existing network of bicycle paths	2014-2020	100.000	3.687.960	-
EST 5- Optimization of vehicle routes of the Municipality	2011-2020	10.000	26.700	

Measure / Action	Application	Cost (€)	Emissions Reduction (Kg _{CO2} / year)	Depreciation /Repayment
Energy Saving in street lighting				
ESSL 1: Energy saving in street lighting	2013	1.608.000	2.777.280	3,51 years
Investments of the Municipality of Strovolos in RES				
RES 1: Investments of the Municipality in Renewable Electricity	2014-2016	600.000	355.050	4,43 years
Development of green spaces in Strovolos Municipality				
DGS 1: Development of green spaces in the Municipality	2012-2020	11.000	90.000	-
TOTAL		3.409.300	28.313.424	

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

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

Table 25. Total presentation of energy saving from national measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Energy Saving (MWh/year)			
		Residential	Tertiary	Industrial	Transports
1	Legislation on Energy Building Performance (Equation 1)	6.645	6.270	793	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	3.190	3.010	381	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	1.116	1.053	133	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	797	752	95	0
5	Legislation on energy efficiency of appliances (Equation 1)	4.731	5.788	825	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	2.322	1.935	3.870	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	591	664	96	0
8	Grant Schemes for thermal insulation of buildings	14.000	3.000	6.000	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	1.809	0
10	Plan of single urban transport system (Equation 3)	0	0	0	76.591
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	50.770
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	12.185
13	Grant Schemes for hybrid vehicles and vehicles with low CO2 emissions (Equation 3)	0	0	0	6.499
14	Discounts on vehicles registration for vehicles with low CO2 emissions (Equation 3)	0	0	0	8.123
TOTAL PER SECTOR		19.393	25.743	8.321	154.167
GRAND TOTAL		207.624			

Table 26. Total presentation of reducing CO₂ emissions from national measures

NATIONAL MEASURES FOR ENERGY		Emission Reduction (tCO ₂ /year)			
		Residential	Tertiary	Industrial	Transport
1	Legislation on Energy Building Performance (Equation 1)	4.712	4.612	579	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	2.262	2.214	278	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	792	775	97	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	565	553	69	0
5	Legislation on energy efficiency of appliances (Equation 1)	3.355	4.257	602	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	1.647	1.423	2.822	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	419	488	70	0
8	Legislation on energy efficiency of existing buildings with an area greater than 1000m ² (Equation 1)	0	4.612	231	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	1.319	0
10	Plan of single urban transport system (Equation 3)	0	0	0	19.347
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	12.824
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	3.078
13	Grant Schemes for hybrid vehicles and vehicles with low CO ₂ emissions (Equation 3)	0	0	0	1.642
14	Discounts on vehicles registration for vehicles with low CO ₂ emissions (Equation 3)	0	0	0	2.052
TOTAL PER SECTION		13.753	18.933	6.068	38.943
GRAND TOTAL		77.697			

Table 27. Equations used for access contribution of the national measures to save energy

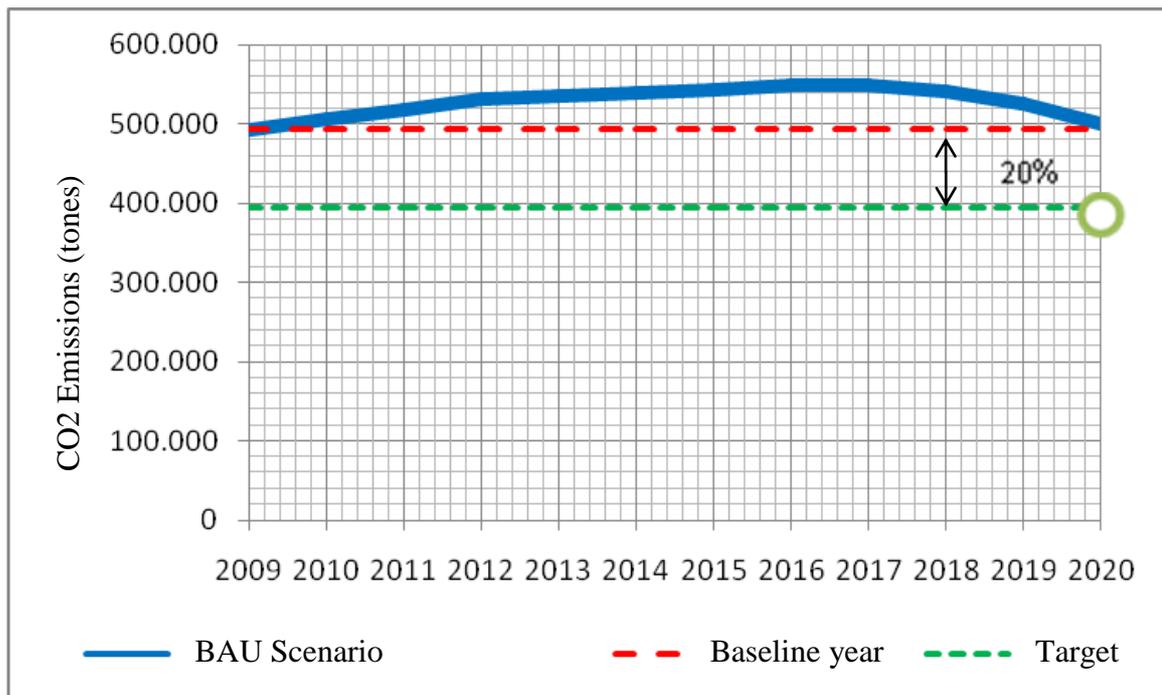
(1) $ES=EC*np*nc*ns$
ES: Energy Saving (MWh) EC: Energy Consumption (MWh) np: Number of Participation (0-100%) nc: Consumption rate per consumption category (0-100%) ns: Saving Percentage by applied measure (0-100%)
(2) $GE=N*P*np$
GE: Green Energy (MWh) N: Population P: Production per application (MWh) np: Number of participation (0-100%)
(3) $EOS=(N*FO*np)+(\Delta O*FO*np)$
EOS: Energy Saving from fuel MWh N: Population FO: Saving Energy per person (MWh) np: Number of participation (0-100%) ΔO : Passing Vehicles

7.10 Description of achieving emission reduction of CO₂ for 2020.

The overall goal of reducing carbon dioxide emissions achieved by implementing the action plan for 2020, is 21,5% reduction compared to the reference year 2009. Achieving this objective is presented in the table below.

Emission inventory for reference year 2009 (tnCO ₂ /year)	493.136
Expected emissions for 2020 – Expected Development Scenario (tn CO ₂ /year)	500.902
Estimated emission reduction from national measures for 2020 (tn CO ₂ /year)	77.697
Estimated emission reduction by the Municipality for 2020 (tn CO ₂ /year)	28.313
Total estimated emission reductions for 2020 (tn CO ₂ /year)	106.010
Estimated emissions for 2020 of the Action (tn CO ₂ /year)	394.482
Emission reduction percentage by 2020 compared with 2009	20%

Figure 31. Schematic of the Expected Evolution Scenario of CO₂ emissions in Strovolos Municipality and the reduction target for 2020 by 20%



Therefore, the implementation of Energy Action Plan, the Municipality of Strovolos will reduce carbon dioxide emissions by 20% compared to 2009 (reaching 394.482 tons of CO₂).

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
- Income from 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 Structural Funds.
- Potential funding from the Fund created for Emissions Trading Scheme.
- Possible funding from other European Programmes.

Sources of energy data

- ▶ Fuel/heating fuel consumption from oil companies within the administrative limits of Strovolos 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 CO₂ 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 Plan for Energy Efficiency 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 from the Electricity Authority of Cyprus [www.eac.com.cy]
- ▶ Energy consumption data in municipal buildings from the Municipality of Strovolos.
- ▶ 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>]

Note:

This report is based on all the available data at the date of its preparation (October 2011).

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