www.islepact.eu

PACT OF ISLANDS

Sustainable Energy Action Plan

POLI CHRYSOCHOUS MUNICIPALITY - CYPRUS

10 January 2012

Brief Summary

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

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

Cyprus participation involves 12 Municipalities and 2 Communities, including Poli Chrysochous Municipality.

The Poli Chrysochous, northwest of Cyprus, has an area of 1.870 hectares with a population of about 2000 inhabitants. Is a town and independent municipality of Cyprus in Paphos.

The year 2009 was designated as the year of referencing/recording energy consumption and CO_2 emissions in the Municipality's territory. According to actual consumption data collected by the Electricity Authority of Cyprus (utility), the oil companies, the Statistical Service of Cyprus, etc, the total energy consumption in 2009 in Poli Chrysochous was 77.084 MWh The largest consumer of energy in the municipality is transport with 57.071 MWh followed by the tertiary sector 13.596 MWh while the residential sector had a total consumption 5.123 MWh.

The CO2 emissions in 2009 attributable to the overall energy consumption in the municipality are 27.658 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 29.590 tons.

The Sustainable Energy Action Plan that was prepared for the Municipality includes additional measures / actions to achieve at least the European goal of combating climate change. That is, the measures that will be taken by the Municipality in addition to national measures in order to overcome the goal of reducing 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 Saving in Municipality public buildings	3
Energy Saving via informational campaigns	8
Energy saving in transport	2
Energy saving in street lighting	1
Municipality investments in renewable energy sources	1
Development of green spaces	1

The estimated annual emissions reduction for 2020 by applying the above measures amounts to 1.896 tons it was estimated that the impact on Poli Chrysochous Municipality from the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 4.805 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 6.701 tons, annual emissions for 2020 will be limited to 22.092 tons. That is, **20,1%** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2012 to 2020 amounts to €177.800. 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 sustainable development and competitiveness program of the Planning Bureau.
- Potential funding from the Fund created for Emissions Trading Scheme.
- Potential funding from other European programs.

Contents

Tables

Figures

1. ISLE-PACT PROJECT

1.1. Introduction

The main objective of the ISLE-PACT project is the development of Local Sustainable Energy Action Plans, aiming at achieving European sustainability objectives as defined by the EU for 2020, namely a reduction of 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.

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 singing the Covenant of Islands

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

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

1.3. Participating Municipalities and Communities in Cyprus

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

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

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

1.4. Ceremony of signing of the Pact of Islands

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

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

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

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

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

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

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

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

Figure 9 The President of Psimolofou Community Ioannis Lazarides

2. CYPRUS

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

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

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

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

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

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

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

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

Source: http://europa.eu

3. POLI CHRYSOCHOUS MUNICIPALITY

3.1. Introduction

The town of Chrysochous (Cyprus is known as the Poli or Chrysohou) is a town and independent municipality of Cyprus in Paphos. Located on the bay of Chrysochous in the north west of the island has an area of 1.870 hectares with a population of approximately 2000 residents and is the smallest municipality in Cyprus. The major attractions are the archeological museum, the museum - the cultural center and the baths of Aphrodite. The Poli Chrysochous is the ideal holiday for lovers of authentic seeking rest and tranquility in a pleasant and friendly environment, which blends mountains, sea and plain with a wonderful healthy climate, a mild winter, a particularly warm, clear sea and sandy beaches. The Poli Chrysochous is considered as the prime destination for nature lovers and those interested in holiday activities such as hiking, biking, horseback riding and golf. The golf course at Tsada is only 25 minutes away from Polis Chrysochous.
The area of Poli Chrysochous has many tourist accommodations for every taste and requirement: luxury hotels, which will satisfy even the most demanding, hotels and staff are devoted to those seeking special interests and a particular color of their vacation, tourist villages, for those seeking beauty, apartments with all amenities for more independent, villas with private pools for the most lonely, but simple family groups for those who want companionship. For lovers of nature and even the camp's camping area next to the sea in a eucalyptus forest.

Also, Poli Chrysochous gives visitors all the amenities needed for a pleasant and comfortable stay: The Information Office of CTO, banks, hospitals, pharmacies, shops, restaurants, taverns with traditional Cypriot cuisine, fish taverns, bars, cafes.

Still, the area of Poli Chrysochous has a remarkable history that goes back to the past three thousand years. Notable archaeological sites is the Archaeological Museum, which gives the opportunity to the visitors to see artifacts from the ancient Marion-Arsinoe, and the Church of Agios Andronikos, with samples of paintings from the 16th century. The City has also showcase good examples of traditional architecture. The central core of the city with restored stone building has been converted into quaint pedestrian street. Square-pedestrian zone of city with cafes, bars and restaurants are now gathering place year round from dawn to dusk.

Figure 10 Chrysochous Bay

3.2. Planning Areas

3.2.1. Introduction

The written text of the Policy Statement published by notification No. 1612 in the Official Gazette of the Cyprus Republic on 27 December 1996 and amended by the publication of the notification No. 335 in the Official Gazette of the Cyprus Republic of no.3406 and dated 12 May 2000 . The Policy Statement of Polis Chrysochous of 2003 posted and filed under the provisions of subsections (1), (6) and (7) of Article 34 A of the Urban and Regional Planning Law (Law 90 of 1972, 56 of 1982, 7 of 1990, 28 1991, 91 (I) 1992, 55 (I) 1993, 72 (I) 1998, 59 (I) 142 (I) 1999 and 241 (I) 2002.

3.2.2. Policy Statement

The area of Polis Chrysochous Policy Statement covers the borough of Polis Chrysochous (Prodromou parishes and Polis Chrysochous and former part of the administrative region Makountas) and the extent amounts to 1925 hectares. According to the census population (Report Statistics Census-2001-Data Provisional Population by Province, City and Community), in 2001 the region had a population of approximately 1,890 people.

3.2.3. Purpose and Strategy of the Development Plan 2003

The Policy Statement of Polis Chrysochous is to define and implement the appropriate term planning policy framework that will allow the rational development of Poli Chrysochous until 2012, which is defined as the horizon year of this Development Plan.

The General Development Strategy Policy Statement is intended to concentrated (organized and consolidated) development of modules of settlements to maintain their independence architecture while ensuring functional unity and urban-rural character of the area as a whole.

3.2.4. Urban Development Areas

Under of Polis Chrysochous, residential development will normally permitted in the following areas covered in Areas of Development:

(a) The designated Residential Zones and Zones holiday residence as shown in the Plan Land Use Plan and Urban Areas Policy Statement of Polis Chrysochous feature code-Ka, PK and PA.
(b) At all levels and areas or routes set out in this Policy Statement on Housing Trade Development (Central Commercial Area, Axes activities and local shopping centers), provided that in the opinion of the Planning Authority will not cleaved substantially the continuity of the commercial use at ground level where it is desirable.
(c) The designated tourist areas. The construction of housing is not permitted in Industrial or Industrial Area and in Protection Zones.

3.2.5. Traffic Management/Depression

The traffic management measures and recession set out in Policy Statement is expected to contribute significantly to improving the quality of the environment, protect the character of the centers of settlements and attempting adjustment of priorities and emphasis on various media traffic (private vehicles, buses, bicycles, pedestrians). Traffic management measures including restriction of access to main roads, regulate parking along roads, perimeter circulation around the central areas of the settlements, one-way, pedestrian and bicycle manufacturing, etc., basically aimed at facilitating and satisfying traffic in some areas without widening roads or other costly construction. Traffic measures aim recession essentially on reducing speeds in sensitive residential areas and commercial and include specific configurations roads, where priority will be the pedestrian, cyclist and resident of the area.

3.2.6. Pedestrian Network- Bicycle Paths

For the transportation needs of pedestrians and cyclists provident the following policy measures:
(a) Gradual implementation of a comprehensive and continuous network of pedestrian and bicycle paths linking residential areas with activity centers, schools, public parks and the beach. Particular emphasis will be placed on developing a system walkways and bicycle paths linking the two settlements to each other and by extension the entire waterfront.
(b) To promote such infrastructures in designing new or improving existing growth areas. Particular emphasis will be given to large integrated developments including industrial, educational, and those related to recreation / entertainment.
(c) Creation of special lanes for bicycles, where practicable, in the construction and upgrading of main roads of the area (roads primary and secondary).
(d) Creation of areas, roads or squares that will be free of road traffic, particularly in the central business district and shopping center of the Prodromos, respectively. Aim will be the widest possible extension of the pedestrian area in order to cover large portions of the cores of the settlements.
The formation of this network, which is sited alongside roads of the primary and secondary road network, based on:
(a) existing and planned distribution of land uses, particularly in connection essential uses, such as public schools, cultural and other functions, large green areas, residential areas, etc., and
(b) traffic, environmental and topographical data.
The planned network that will form the basis for detailed planning and gradual implementation of bicycle lanes through the procedures for exercising control town, or in the implementation of urban projects. If any data make implementing this part of the network difficult, the Planning Authority may modify it after ensuring the agreement of the Technical Committee of the Central Agency for Solving Traffic Problems.

3.2.7. Parking

In the Policy Statement of Polis Chrysochous Municipality Provident creating appropriate parking areas, especially around the main shopping district and along the beachfront. In the CSA, the places are to be created will be directly linked to the anticipated circumferential

ring of the center, while the coast will be joined by the coastal road and ensure thus public access to the sea. It is also envisaged to adopt rational and balanced policy for the parking of vehicles based on the following principles:

(a) Ensuring adequate parking to meet the

needs through the provision of facilities in private developments and public parks,

(b) Strictly controlled parking along main roads, especially the primary road network, with the exception only where absolutely necessary.

(c) Encouragement for parking spaces for customers and branch offices in specially designated public and private spaces.

(d) Providing appropriate incentives to landowners for construction and parking spaces available at convenient locations and where it is needed.

(e) Adjustment of parking short and long term for customers and employees with measures to discourage depending on the density of use of each area.

(f) Construction of public parking spaces sufficient capacity in each project on urban street prime importance.

3.2.8. Public Transport

In the Policy Statement, which is the main tool for urban policy is not determined directly by the public sector policy for public transport but it focuses on ensuring the operating conditions and infrastructure to assist in upgrading and organization. The Policy Statement is intended to serve the regional distribution center with Polis and to facilitate tourists and students than to promote the transport due to the small scale of the municipal area Polis. Baseline measures of this policy is to facilitate the operation of school buses and the introduction of bus service small size (mini-buses) to connect the coastal areas to the center of Polis, especially during the tourist season.

Figure 11 Cultural Center

Figure 12 Archological Museum Mariou/Arsinois

Figure 13 Town Hall

Figure 14 Camping Area

Figure 15 Agia Paraskevi Church

Figure 16 Central Square

Figure 17 Pedestrian Street

Figure 18 Central Core

Figure 19 Football Field

Figure 20 Apostolou Andrea Cathedral

Figure 21 Panoramic View

4. CURRENT STATUS AT POLI CHRISOCHOUS MUNICIPALITY

4.1. Description of Poli Chrisochous Municipality Buildings

4.1.1. Summary

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

Table 1 Energy Consumption at the Pili Chrisochous Municipality Buildings

Energy Consumption (kWh)		2009	2010
Municipal Cultural Center		10.110	20.220
Municipal Slaughterhouse		101.906	
TOTAL	112.016		

4.2. Poli Chrisochous Municipality Street Lighting

The total energy consumption in 2009 for street lighting was equal to 144 MWh.

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

Table 2 Poli Chrisochous Municipality Lamp Types

HPS *	250 W	1082
HPS	150 W	260
HPS	70 W	6175
Compact	21 W	30

* 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 Poli Chrisochous Municipality.

4.3. Vehicle Fleet of Poli Chrisochous Municipality

The vehicle fleet of the municipality Poli Chrysohous is 9 and consists of vehicles of different types, uses and engine displacement. The table below shows the fleet of the municipality (type, fuel, fuel consumption)

Table 3 Vehicle fleet of Poli Chrisochous Municipality

NUMBER OF VEHICLES	VEHICLE MODELS	FUEL	Consumption 2009 (liters of fuel)
1	Transportation of employees	DIESEL	1697
1	Semi truck	GASOLINE	1518
1	Garbage collecting truck	DIESEL	925
1	Pajero	DIESEL	862
1	Garbage collecting truck	DIESEL	8120
1	saloon	DIESEL	1542
1	saloon	DIESEL	1040
1	Motorcycle	DIESEL	205
1	Sweeping machine	DIESEL	2535

4.5 Population of Paralimni

The number of residences of Poli Chrysohous municipality according to the 2001 Census was 1,847 while according to the 2011 Census, the population stood at 2,021 (9% increase). Also, the number of residences in 2011, according to the Census of 2011 was 2,535 compared to 1,264 dwellings recorded in the 2001 Census, an increase of 101%.

4.7 European and International programs

The Municipality of Poli Chrisochous participates in the following European projects/ initiatives, some of which are co-funders:

Covenants of Islands ISLE-PACT aims at developing Sustainable Energy Action Plans in Islands, in order to achieve the European objectives set for 2020, to a reduction of CO2 emissions by at least 20%	ISLEPACT SUSTAINABLE ENERGY ACTIONS FOR ISLANDS	www.islepact.eu
Medeea The general scope of Meddea Project is to achieve the European goal "20-20-20" in the Mediterranean, through the involvement of local authorities in energy related matters by applying the energy planning tool, European Energy Award-eea®	medeea	www.interregmedeea.eu

5. INVENTORY OF ENERGY CONSUMPTION IN POLI CHRISOCHOUS MUNICIPALITY

5.1. Residential Sector

Table 4 Energy Demand in MWh in the Residential Sector in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Geothermal**	**Biomass**	Total
Hot water	89	78	6	363	3	20	**559**
Heating and cooling	2.145	1.279	151	11	8	188	**3.782**
Lighting	119	-	-	-	-	-	**119**
Kitchen	89	-	38	-	-	0	**128**
Electrical appliances	536	-	-	-	-	-	**536**
Total	**2.979**	**1.358**	**194**	**374**	**10**	**208**	**5.123**

5.2. Primary Sector

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

Description	**Electricity**	**Fuel Oil**	**Diesel**	**LPG**	**Wind**	**Biomass**	Total
Agriculture, Forestries and Fisheries	75	32	13	45	240	30	**390**
Mining and Quarrying	0	0	0	0	0	0	**0**
Total	**75**	**32**	**13**	**45**	**240**	**30**	**390**

5.3. Secondary Sector

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

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Processing	514	216	92	23	8	**852**
Water supply, wastewater treatment, waste management	0	0	0	0	0	**0**
Construction	32	13	6	0	0	**51**
Total	**546**	**230**	**98**	**23**	**8**	**904**

5.4. Tertiary Sector

Table 7 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	4.299	1.808	769	184	61	**7.122**
Hotels and restaurants	2.138	899	383	92	31	**3.542**
Public administration and social insurance	237	100	42	10	3	**393**
Defence, Justice, Police and Fire stations/departments	106	45	19	5	2	**176**
Education	309	130	55	13	4	**512**
Human Health and social care	211	89	38	9	3	**350**
Other Services	820	345	147	35	12	**1.358**
Public Lighting	144					**144**
Total	**8.264**	**3.415**	**1.453**	**348**	**116**	**13.596**

5.5. Transport

Table 8 Final Energy Consumption in MWh in Transports for the Year 2009

Description	**Electricity**	**Diesel**	**Gasoline**	**Biomass**	Total
Urban and suburban passenger transports	1.215	547	571	-	**2.332**
Other passenger transportation services (taxi, tourism, school buses, etc)	0	8.745	9.129	-	**17.874**
Commercial ground transportation services and removable services	0	0	0	-	**0**
Private Vehicles	0	18.037	18.828	-	**36.865**
Total	**1.215**	**27.329**	**28.527**	**-**	**57.071**

5.6. Total Final Energy Consumption in the Municipality of Poli Chrisochous

Table 9 Final Energy Consumption in MWh in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Wind	Solar	Geothermal	Biomass	Total
Residential	2.979	1.358	-	-	194	-	374	10	208	**5.123**
Primary	75	32	-	-	13	240	-	-	30	**390**
Secondary	546	230	-	-	98	-	23	-	8	**904**
Tertiary	8.264	3.415	-	-	1.453	-	348	-	116	**13.596**
Transports	1.215	-	27.329	28.527	-	-	-	-	-	**57.071**
Total	**13.079**	**5.034**	**27.329**	**28.527**	**1.758**	**240**	**745**	**10**	**361**	**77.084**

Figure 22 Share of Final Energy Consumption by Sector in 2009

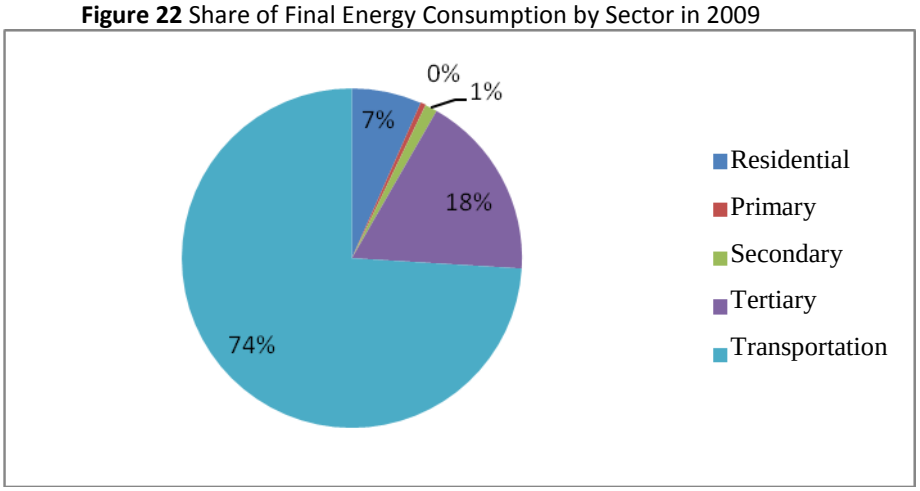
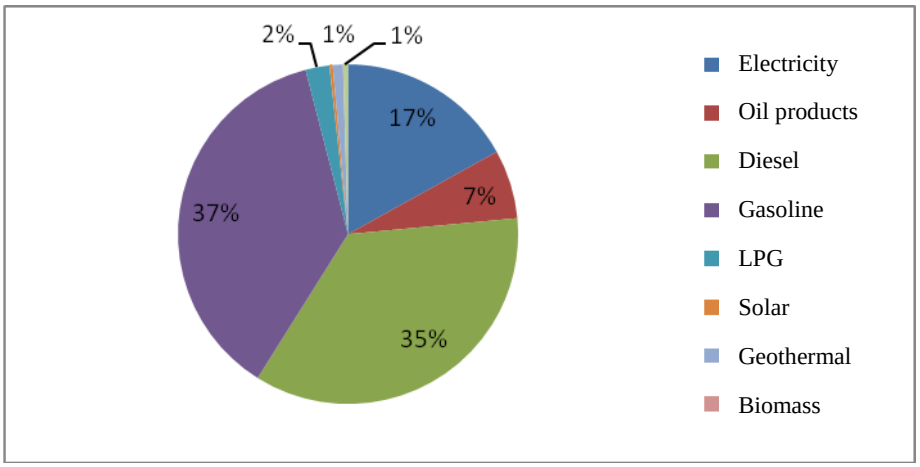


Figure 23 Share of Final Energy Consumption by Energy Source in 2009



6. INVENTORY OF CARBON DIOXIDE (CO_2) EMISSIONS AT POLI CHRISOCHOUS MUNICIPALITY

6.1. Introduction

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

.

Table 10 Coefficients for Calculating CO_2 Emissions

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

6.2. Residential Sector

Table 11 CO_2 Emissions in tones in the Residential Sector of Poli Chrisochous Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**SOLAR**	**Geothermal**	**Biomass**	Total
Hot water	78	22	1	-	-	-	**101**
Heating and cooing	1.875	257	26	-	-	-	**2.268**
Lighting	104	-	-	-	-	-	**104**
Kitchen	78	-	9	-	-	-	**87**
Electrical appliances	469	-	-	-	-	-	**469**
Total	**2.604**	**379**	**47**	**-**	**-**	**-**	**3.029**

6.3. Primary Sector

Table 12 CO_2 Emissions in tones in the Primary Sector of Poli Chrisochous Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**Diesel**	**LPG**	**Biomass**	Total
Agriculturee, Forestries and Fisheries	66	9	-	3	-	**78**
Mining and Quarring	-	1	-	-	-	**-**
Total	**66**	**0**	**4**	**18**	**-**	**78**

6.4. Secondary Sector

Table 13 CO_2 Emissions in tones in the Secondary Sector of Poli Chrisochous Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Processing	449	60	22	-	-	**532**
Water supply, wastewater treatment, waste management	-	-	-	-	-	**-**
Construction	28	4	1	-	-	**8.524**
Total	**477**	**64**	**23**	**-**	**-**	**18.390**

6.5. Tertiary Sector

Table 14 CO_2 Emissions in tones in the Tertiary Sector of Poli Chrisochous Municipality in 2009

Description	**Electricity**	**Fuel Oil**	**LPG**	**Solar**	**Biomass**	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	3.757	504	185	-	-	**4.446**
Hotels and restaurants	1.869	251	92	-	-	**2.211**
Public administration and social insurance	207	28	10	-	-	**245**
Defence, Justice, Police and Fire stations/ departments	93	12	5	-	-	**110**
Education	270	36	13	-	-	**320**
Human health and social care	184	25	9	-	-	**218**
Other services	717	96	35	-	-	**848**
Public lighting	126	-	-	-	-	**126**

Total	**7.223**	**953**	**349**	**-**	**-**	**8.524**

6.6. Transport

Table 15 CO_2 Emissions in for Transports in Larnaka Municipality in 2009

Description	**Electricity**	**Diesel**	**Gasoline**	**Biomass**	Total
Urban and suburban passenger transports	1.062	146	142	-	**1.350**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	2.335	2.273	-	**4.608**
Commercial ground transportation services and mobile services	-	-	-	-	**0**
Private vehicles	-	4.816	4.688	-	**9.504**
Total	**1.062**	**7.297**	**7.103**	**-**	**15.462**

6.7. Total CO_2 emissions in Poli Chrisochous Municipality

Table 16 Total CO_2 emissions in Poli Chrisochous Municipality in 2009

Sector	**Electricity**	**Fuel Oil**	**Diesel**	**Gasoline**	**LPG**	**Solar**	**Geothermal**	**Biomass**	Total
Residential	2.604	379	-	-	47	-	-	-	**3.029**
Primary	66	9	-	-	3	-	-	-	**78**
Secondary	477	64	-	-	23	-	-	-	**565**
Tertiary	7.223	953	-	-	349	-	-	-	**8.524**
Transports	1.062	-	7.297	7.103	-	-	-	-	**15.465**
Total	**11.431**	**1.404**	**7.297**	**7.103**	**422**	**-**	**-**	**-**	**27.658**

Figure 24 Share of CO_2 Emissions by Sector in 2009

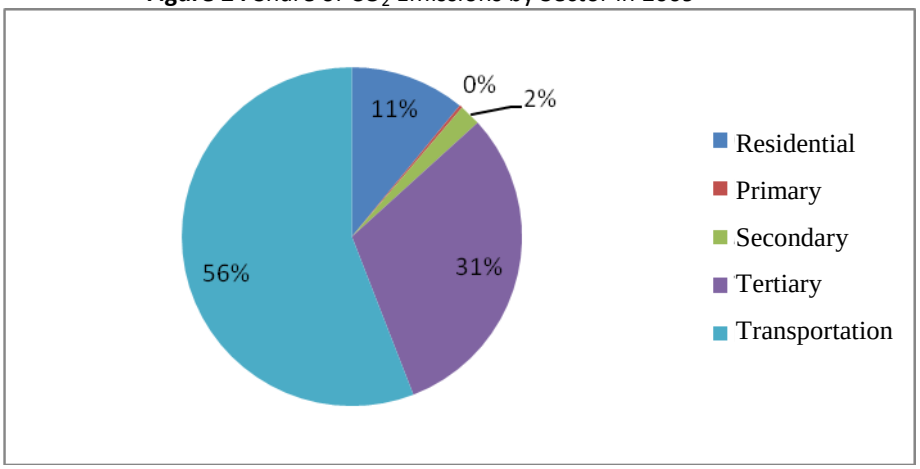
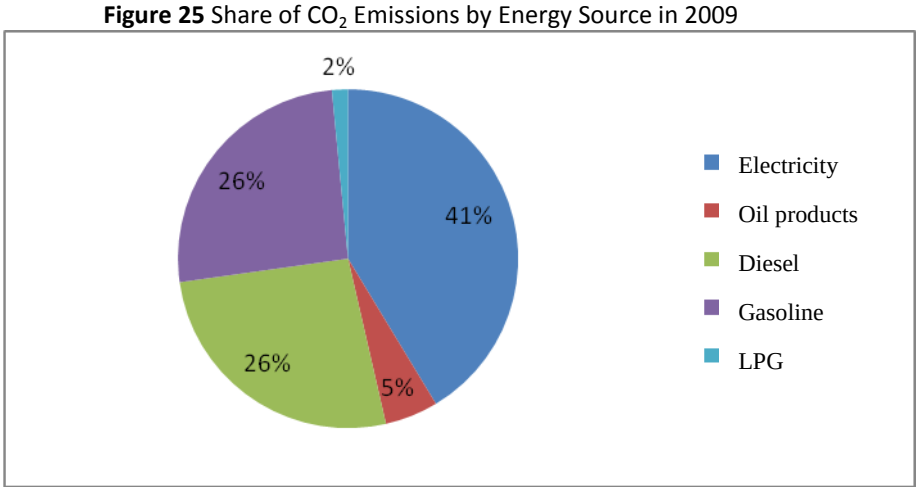


Figure 25 Share of CO_2 Emissions by Energy Source in 2009



6.8. Forecasting/ Projection Scenario of CO_2 Emissions

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

1. Use of annual growth rates of energy consumption per sector based on the statistics available during the preparation of the Energy Action Plan (see Table 17)
2. Use of annual growth rates of energy efficiency at the end-use due to the improvement of existing technologies (see Table 18)
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 19).
4. The gradual introduction, use and integration of natural gas into the power generating system.

Table 17 Growth Rates of Energy Consumption per Consumer used in the expected evolution scenario

Sector Descripion	Estimated annual energy consumption rate
Residential	
Hot water	1,5%
Heating and Cooling	1,5%
Lighting	1,5%
Cooking	1,5%
Refrigerators and freezers	1%
Washing and drying machines	1%
Dishwashers	1%
Televisions	1%
Other electrical appliances	1%
Primary Sector	
Agriculture, forestries and fisheries	1%
Mining and quarring	0%
Secondary Sector	
Processing	1%
Water supply, wastewater treatment, waste management and remediation activities	0%
Construction	1%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	2%
Accommodation services activities and food services	3%
General public administration and social insurance	1%
Defense and justice services, police and fire stations/ departments	1%
Education	1%
Activities relatd to human health and social care	1,5%
Other servics	3,5%
Municipal/ Public lighting	1,5%
Transports (vehicles)	
Private transports	1,5%
Urban and suburban passenger transports	3%
Other road transport services (taxi, tourism, school buses, etc.	,%
Freight road transports and removal services	2%
Secondary energy production	
Solar energy for electricity generation	3%
Wind energy for electricity generation	1%
Solar energy for heating and cooling	2%
Geothermal energy for heating and cooling	1%

Table 18 Increased Efficiency in Energy End-use (Reducing the Final Energy for the same Useful Energy)

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

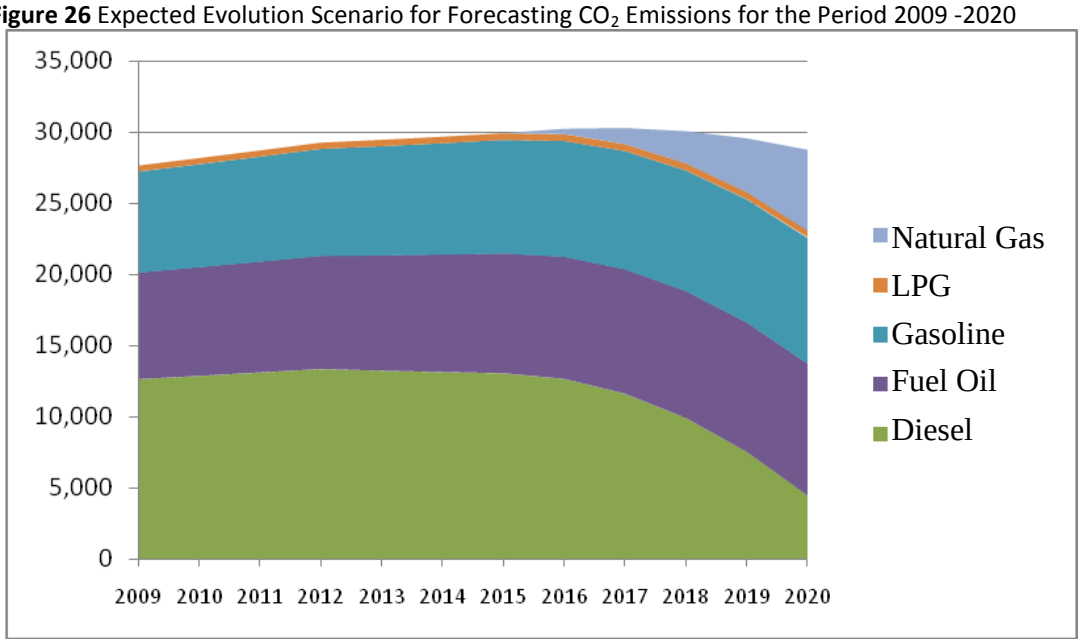
Table 19 Coefficients of Energy Performance of Electricity Generation

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

Table 20 Expected Evolution Scenario for Forecasting CO_2 Emissions for the Period 2009 - 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Percentage increase based on 2009
2009	12.640	7.492	7.103	422	0	27.658	0%
2010	12.875	7.640	7.243	431	0	28.189	2%
2011	13.114	7.791	7.387	440	0	28.732	4%
2012	13.359	7.945	7.533	449	0	29.287	6%
2013	13.244	8.103	7.683	459	0	29.488	7%
2014	13.142	8.264	7.836	468	0	29.710	7%
2015	13.060	8.420	7.993	478	0	29.952	8%
2016	12.666	8.581	8.153	488	377	30.265	9%
2017	11.623	8.746	8.316	499	1.132	**30.316**	10%
2018	9.919	8.914	8.484	510	2.267	**30.095**	9%
2019	7.542	9.087	8.655	521	3.786	29.590	7%
2020	**4.477**	**9.264**	**8.830**	**532**	**5.690**	**28.793**	**4%**

Figure 26 Expected Evolution Scenario for Forecasting CO_2 Emissions for the Period 2009 -2020



7. POLI CHRISOCHOUS MUNICIPALITY SUSTAINABLE ENERGY ACTION PLAN FROM 2011 TO 2020

7.1. Introduction

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

Emissions Reference Year 2009 (tn CO_2/year)	Expected annual emissions in 2020 (tn CO_2/year)	Average growth rate in Emissions (tn CO_2/year)	Minimum emissions target in 2020 (tn CO_2/year)	Desired minimum (20%) emissions reduction (tn CO_2/year)
27.658	28.793	103	22.126	6.667

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

The measures are divided in the following main areas:

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

7.2. Energy Saving in Public Buildings

Measure ENEF 1 – Thermal Insulation

The indirect cost of the application of this measure is not particularly important, as the following requirements must first be fulfilled: (a) preparation of terms for receiving tenders, (b) evaluation of the offers by technical and financial criteria. Implemented period 2014-2016.

Estimated energy saving: 40.000 kWh/year

Estimated emissions reduction: 23.000 kg. CO_2/year

Estimated interventions cost: 15.000 €

Estimated saving: 7.000 €

Measure ENEF2: Lamps replacement

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

Implemented period 2012.

Estimated energy saving: 3.000 kWh/ year

Estimated emissions reduction: 2.600 kg. CO_2/ year

Estimated interventions cost: 1.000 €

Estimated saving: 600 €

Measure ENEF3: Maintenance of air conditioning systems

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

Measure implementation period: 2012 - 2020

Estimated energy saving: 20.000 kWh/ year

Estimated emissions reduction: 11.500 kg. CO_2/ year

Estimated interventions cost: 2.000 €

Estimated saving: 3500 €

7.3. Energy Saving through awareness raising campaigns

Measure ESAC1: Organization of educational presentations to students

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

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

Measure implementation period: 2012-2020

Measure Code	**ESAC 1**	
Measure Name	**Organization of educational presentations to students**	
APPLICATION COST		
Cost of Measure	**1.800 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**201.600kWh/year** The financial benefits for interested parties **142.934 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.001€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 350*6*0.4*3*80kWh/year= 2.016.000 kWh/year

Measure ESAC2: Organization of "Day without lighting"

The organization of an annual day without lighting in Poli Chrisochous Municipality was examined. The measure will apply for a period of 7 years.

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

Implementation on 30 March 2013

Measure Code	**ESAC 2**	
Measure Name	**Organization of "Day without lighting"**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**151.200 kWh/year** The financial benefits for interested parties **107.200 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.003€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 300*7*0.20*3*120kWh/year= 151.200 kWh/year

Measure ESAC3: Energy Information in the Municipality website

The posting of information on Renewable Energy Sources (RES) and Energy Saving (ES) in the Municipality of Poli Chrisochous website was examined. The measure will apply for a period of 8 years.

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

Start of Implementation: 2012

Measure Code	**ESAC 3**	
Measure Name	**Energy Information in the Municipality website**	
APPLICATION COST		
Cost of Measure	**0 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**192.000 kWh/year** The financial benefits for interested parties **136.128 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.00 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 4000*8*0.15*2*20kWh/year= 192.000kWh/year

Measure ESAC4: Organization of annual seminar on Energy Saving

The organization of an annual seminar on Energy Saving in Poli Chrisochous Municipality was examined.

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

Measure implementation period: 2012 - 2020

Measure Code	**ESAC 4**	
Measure Name	**Organization of annual seminar on Energy Saving**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**1.054.080 kWh/year** The financial benefits for interested parties **747.343 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.006€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 160*8*0.3*3*915kWh/year=1.054.080kWh/year

Measure ESAC5: Free consulting services to the citizens from Municipal Officers

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

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

Start of Implementation: 2013

Measure Code	**ESAC 5**	
Measure Name	**Free consulting services to the citizens from Municipal Officers**	
APPLICATION COST		
Cost of Measure	**0 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**344.250 kWh/year** The financial benefits for interested parties **244.073 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.00 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 255*3*0.75*3*200kWh/year=344.250 kWh/year

Measure ESAC6: Organization of "Cycling Day"

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

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

Start of Implementation: September 2012

Measure Code	**ESAC 6**	
Measure Name	**Organization of "Cycling Day"**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy saving. €/year) Environmental (kg CO_2-eq)	**288.000 kWh/year** The financial benefits for interested parties in terms of fuel saving **72.864 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.04€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 200*8*0.2*3*300kWh/year= 288.000 kWh/year

Measure ESAC7: Distribution of leaflets for the energy savings to the tourist accommodation

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

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

Measure Implementation Period: April 2012

Duration 8 years

Measure Code	**ESAC 7**	
Measure Name	**Informational leaflets**	
APPLICATION COST		
Measure Cost	**2.000 €**	
Indirect Cost	☐ **– High** ☐ **– Avearge** ☒ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Saving en. €/year) Environmental (kg CO_2-eq)	**400.000 kWh/year** The financial benefits for interested parties in terms of energy saving **283.600 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.014€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 2000*8*0.5*50kWh/year= 400.000kWh/year

Measure ESAC8: Informational leaflets and messages

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

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

Measure Implementation Period: June 2012-2020

Measure Code	**ESAC 8**			
Measure Name	**Informational leaflets and messages**			
APPLICATION COST				
Measure Cost	**Total (€)**			
(a) Leaflets on RES and ES	**2.000 €**			
(b) Leaflets on sustainable mobility	**2.000 €**			
Indirect Cost				
	☒ **– High** ☐ **– Average** ☐ **– Low**			
APPLICATION BENEFITS				
Energy	Number/ receivers	Awareness Percentage	Energy Benefit (kWh/person.year)	**Energy Saving (kWh/year)**
(a) Leaflets on RES and ES	400	5%	1100	**22.000**
(b) Leaflets on sustainable mobility	400	5%	2210	**44.200**
Financial				
	The financial benefits for interested parties in terms of energy saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
(a) Leaflets on RES and ES	15.598			
(b) Leaflets on sustainable mobility	11183			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**	
(a) Leaflets on RES and ES	**0.13 €/ $kg_{CO2\ annual\ saving}$**		☒	
(b) Leaflets on sustainable mobility	**0.18 €/ $kg_{CO2\ annual\ saving}$**		☒	
DELIVERABLE				
Total Cost **4.000 €**		**Emission Reduction** **26.781 Kg_{CO2}/ year**		

7.4. Energy Saving in Transport

Measure EST1: Energy saving in the Municipality's fleet

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

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

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

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

Measure Implementation Period: 2014-2018

Measure Cost	**EST 1**		
Measure Name	**Energy saving in the Municipality's fleet**		
APPLICATION COST			
Cost of measure	**Total (€)**		
Purchase of 2 eco-cars	**35.000 €**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
Purchase of 2 eco-cars	**18.420**		
Financial	**Saving (€/year)**		
Purchase of 2 eco-cars	**2000**		
Environmental	**Emissions saving (kg_{CO2}/ year)**		
Purchase of 2 eco-cars	**4.653**		
RESULTS - EVALUATION			
Unitary Cost (€/kg CO_2)			**Proposed for implementation**
Purchase of 2 eco-cars	**7.52 €/ $kg_{CO2\ annual\ saving}$**		☒
DELIVERABLE			
Total Cost **35.000 €**		**Emissions Reduction** **4.653 Kg_{CO2}/ year**	

Measure EST2: Energy Saving in Transport by Upgrading the Cycle Path Network in Poli Chrisochous

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

The indirect application costs is considered low.

Start of Implementation: 2015 (for 6 years)

Measure Code	**EST 2**			
Measure Name	**Upgrade of Cycle Path Network**			
APPLICATION COST				
Cost of measure	**Total (€)**			
Upgrade of Cycle Path Network	**25.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	New Cycle Paths (km)	Traffic per Year (Number of routes)	ES per Km + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
Upgrade of Cycle Path Network	4	1.500	20	**120.000**
Financial				
	The financial benefits for interested parties from fuel saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
Upgrade of Cycle Path Network	**30.312**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)				**Proposed for implementation**
Upgrade of Cycle Path Network	**0.82€/ $kg_{CO2\ annual\ saving}$**			☒
DELIVERABLE				
Total Cost 25.000 €		**Emissions Reduction 30.312 Kg_{CO2}/ year**		

7.5. Energy Saving in the Street Lighting

Measure ESSL1: Energy Saving in Street Lighting

The possibility of energy saving in street lighting was examined. Street lighting is one of the major expenses of the Municipality. The electricity consumption for street lighting in Poli Chrisochous Municipality in 2009 was 144.000 kWh.

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

The indirect application cost can be considered low.

Year of Measure Implementation: 2014

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

7.6. Investements of Poli Chrisochous Municipality in RES

Measure RES1: Renewable Electricity with Photovoltaic Systems

The creation of two Photovoltaic Parks was examined.

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

Measure Implementation Period: 2016

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

7.7. Development of Green Spaces

Measure DGS1: Development of green spaces

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

The indirect application cost can be considered low.

Measure Code	**DGS 1**		
Measure Name	**Development of green spaces**		
APPLICATION COST			
Cost of measure	**Total (€)**		
(a) Planting of trees (200 trees)	**500 €**		
(b) Care of Green Spaces	**1.000 €**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
(a) Planting of trees (200 trees)	**6.000**		
(b) Care of Green Spaces	**3.000**		
RESULTS - EVALUATION			
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**
(a) Planting of trees (200 trees)	**0.08 €/ $kg_{CO2\ annual\ saving}$**		☒
(b) Care of Green Spaces	**0.33 €/ $kg_{CO2\ annual\ saving}$**		☒
DELIVERABLE			
Total Cost **1.500 €**		**Emission Reduction** **9.000 Kg_{CO2}/ year**	

7.8. Summary of Measures of Poli Chrisochous Municipality

The table below is a summary of all the measures taken by the Municipality to achieve the goal of reducing C02 emissions by 20% by 2020.

Table 21 Brief Presentation of Measures Taken by Poli Chrisochous Municipality and Included in the Sustainable Energy Action Plan

Measure/ Action	Application	Cost (€)	Emissions Reduction (Kg_{CO2}/ year)	Depreciation (years)
Energy Saving in Public Buildings				
ENEF 1: Insulation Interventions	2014-2016	15.000	23.000	2,1 years
ENEF 2: Lamps replacement	2012	1.000	2.600	1,7 years
ENEF3: Maintenance of Air Conditioning Systems	2012	2.000	11.500	0,6 years
Energy Saving through Awareness Raising Campaigns				
ESAC1: Organization of educational presentations to students	2012 - 2020	1.800	142.934	
ESAC2: Organization of "Day without lighting"	2013-2020	1.500	107.200	-
ESAC3: Information about energy in the Municipality website	2012	0	136.128	-
ESAC4: Organization of an annual seminar on Energy Saving	2013-2020	3.000	747.343	
ESAC5: Free consulting services to citizens from Municipal Officers	2013-2020	0	244.073	-
ESAC6: Organization of "Cycling Day"	2012-2020	3.000	72.864	-
ESAC7: Distribution of leaflets in the tourist accomodation	2012-2020	2.000	283.600	-
ESAC8: Raising awareness through informational leaflets and messages	2012-2020	4.000	26.781	-
Energy Saving in Transports				
EST1: Energy saving in the Municipality's fleet	2014-2018	35.000	4.653	-
EST2: Energy Saving in Transport by Upgrading the Cycle Path Network in Poli Chrisochous	20150	25.000	30.312	-
Energy Saving in Street Lighting				
ESSL1: Energy saving in street lighting	2015	22.500	62.928	1.74 years
Investments of Poli Chrisochous Municipality in RES				

RES1: Investments of Poli Chrisochous Municipality in renewable electricity (solar)	2016	60.000	52.440	4 years
Development of Green Spaces				
DGS1: Development of Green Spaces	2012-2020	1.500	9.000	-
TOTAL		**177.800**	**1.895.917**	

7.9. Contribution of National Measures on the Sustainable Energy Action Plan of Poli Chrisochous Municipality

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

Table 22 Brief Presentation of Energy Saving from National Measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Energy Saving (MWh/year)			
		Residential	Tertiary	Industry	Transports
1	Legislation on Energy Building Performance (Equation 1)	102	262	19	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	49	126	9	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	17	44	3	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	12	31	2	0
5	Legislation on energy efficiency of appliances (Equation 1)	73	242	20	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	81	67	135	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	9	28	2	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	262	8	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	43	0
10	Plan of single urban transport system (Equation 3)	0	0	0	6.984
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	4.766
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	1.144
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	610
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	762
	TOTAL PER SECTOR	343	1.064	241	14.265
	GRAND TOTAL	15.913			

Table 23 Brief Presentation of CO_2 Emissions Reduction from National Measures

	NATIONAL MEASURES FOR ENERGY EFFICIENCY	Emissions Reduction (t CO_2/year)			
		Residential	Tertiary	Industry	Transports
1	Legislation on Energy Building Performance (Equation 1)	72	193	14	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	35	93	7	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	12	32	2	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	9	23	2	0
5	Legislation on energy efficiency of appliances (Equation 1)	52	178	14	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	57	49	98	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	6	20	2	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	193	6	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	32	0
10	Plan of single urban transport system (Equation 3)	0	0	0	1.764
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	1.204
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	289
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	154
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	193
	TOTAL PER SECTOR	243	782	176	3.603
	GRAND TOTAL	4.805			

Table 24 Equations Used for the Estimation of the Contribution of the National Measures to Energy Saving

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

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

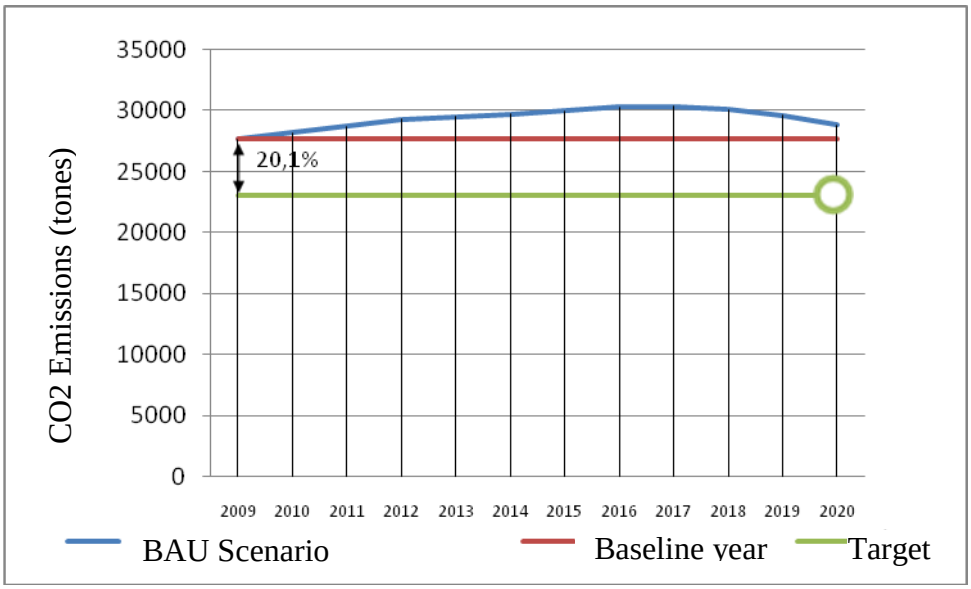
(3) EOS=(N*FO*np)+(ΔO*FO*np)
EOS: Energy Saving in terms of Fuel (MWh) N: Population FO: Fuel Saving per person (MWh) np: Participation percentage (rate) (0-100%) ΔO: Passing Vehicles

7.10. Description of Achieving CO2 Emission Reduction for 2020

The overall goal of reducing carbon dioxide emissions achieved by implementing the action plan for 2020, is 20,1% reduction compared to the reference year 2009. The achievement of this objective is presented in the table below.

Emission inventory for reference year 2009 (tn CO_2/year)	27.658
Expected emissions for 2020 – Expected Development Scenario (tn CO_2/year)	28.793
Estimated emission reduction from national measures for 2020 (tn CO_2/year)	4.805
Estimated emission reduction by the Municipality for 2020 (tn CO_2/year)	1.896
Total estimated emission reduction for 2020 (tn CO_2/year)	6.701
Estimated emissions for 2020 through the application of the Action Plan (tn CO_2/year)	22.092
Emission reduction percentage by 2020 compared with 2009	**20,1%**

Figure 27 Schematic of the Expected Evolution Scenario of CO2 Emissions in Paralimni Municipality and the Reduction Target for 2020 by 20,1%



Therefore by implementing the Sustainable Energy Action Plan, the Municipality of Larnaka will reduce carbon dioxide emissions by **20,1 %** compared to 2009 (reaching 22.092 tons CO_2), thus exceeding the overall objective of the project to reduce emissions by 20%.

7.11. Financing the Sustainable Energy Action Plan

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

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

Sources of energy data

- Consumption of fuels and heating fuels from oil companies within the administrative limits of Paralimni Municipality.
- LPG consumption from the Statistical Service of Cyprus (Reduction at local level based on the population) [www.mof.gov.cy/cysta*]*
- Annual growth rates from the Statistical Service of Cyprus and estimates of scholars [www.mof.gov.cy/cysta*]*
- National Action Plan for reducing CO_2 emissions from the Department of Environment [http://www.cyprus.gov.cy/moa/agriculture.nsf]
- National Action Plans for the share of RES from the Energy Service. [http://www.mcit.gov.cy/mcit/mcit.nsf]
- National Action Plans for Energy Saving at end-use from the Energy Service. [http://www.mcit.gov.cy/mcit/mcit.nsf]
- Grant Schemes for RES and ES from the Energy Service

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

- Development of Public Transport Plans from the Department of Road Transport [www.mcw.gov.cy/mcw/rtd/rtd.nsf*]*
- Electricity Consumption data in the Municipality of Paralimni from the Electricity Authority of Cyprus [www.eac.com.cy*]*
- Energy consumption data in municipal buildings in Poli Chrisochous
- 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]

Prepared by: **Cyprus Energy Agency**
Anthi Charalambous
Savvas Vlachos
Orestis Kyriakou

Contact Details:
10-12 Lefkonos Street, 1011 Nicosia, Cyprus
Tel. +357-22667716, +35722667736
Fax: +357-22667736
Email: anthi.charalambous@cea.org.cy
savvas.vlachos@cea.org.cy
orestis.kyriakou@cea.org.cy
Web: www.cea.org.cy

Supervision: **Poli Chrisochous Municipality**
Mayor Aggelos Georgiou

Municipal Secretary Neophyta Kyprianou
Health inspector Marios Sofokli

Contact Details:
Poli Chrisochous Municipality
25th Martiou ,8830
Tel. +357-26321321
Fax: +357-26322278
Email: polismunicipality@cytanet.com.cy

Web: http://www.polis-municipality-cyprus.com/

ISLEPACT Project : Web: http://www.islepact.eu
Tel. +32(0) 2 6121704

Prepared by:

Local Authority:

Financial support:

EUROPEAN COMMISSION
Directorate-General for Energy

DISCLAIMER: