

Sustainable Energy Action Plan

AGIOS ATHANASIOS 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 Agios Athanasios Municipality.

Agios Athanasios is a suburb of Limassol and independent municipality of Cyprus since 1986. Located 3 kilometers from Limassol and owes its name to the patron of the municipality Ayio Athanasio. The population is approximately 15.000 inhabitants.

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 Agios Athanasios was 214.313 MWh. The largest consumer of energy in the municipality is transportation with 99.878 MWh and followed by the residential sector with 47.287 MWh and the secondary sector with 44.453 MWh.

The CO₂ emissions in 2009 attributable to the overall energy consumption in the municipality are 104.386 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 102.393 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	6
Energy Saving via informational campaigns	11
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 5.509 tons. In addition, it was estimated that the impact on Agios Athanasios Municipality

from the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 12.877 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 18.386 tons, annual emissions for 2020 will be limited to 84.007 tons. That is, **20%** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2010 to 2020 amounts to € 627.715. 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.

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1 THE ISLE-PACT PROJECT

1.1 Introduction

The main objective of the ISLE-PACT project is the development of Local Sustainable Energy Action Plans, aiming at achieving European sustainability objectives as defined by the EU for 2020, namely a reduction of 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 the delivery of the final Sustainable Energy Action Plan for evaluation, monitoring and verification of individual goals,
- To organize Energy Days, in collaboration with the European Commission and other stakeholders (e.g. Cyprus Energy Agency), providing an opportunity for citizens to have direct contact with the subject and also to benefit directly from sustainable energy use, as well as informing the local media for individual developments in local action plans,
- Participation in various conferences and workshops organized by various European institutions in connection with the Covenant of Mayors and the Pact of Islands,
- Further implementation of energy investment in the project areas.

1.3 Participating Municipalities and Communities in Cyprus

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

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



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

1.4 Signing Ceremony of the Pact of Islands

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



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



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)



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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:

Political system:

Capital:

Total area:

Population:

Currency:

2004

Democracy

Nicosia (Lefkosia)

9.250 km²

0,8 million

euro

Source: <http://europa.eu>

3 Agios Athanasios Municipality

3.1 Agios Athanasios

Agios Athanasios is a suburb of Limassol and independent municipality of Cyprus since 1986. Located 3 kilometers from Limassol and owes its name to the patron of the municipality Agios Athanasios. The population is approximately 15.000 inhabitants. Areas of the municipality is the Kafkalla, the Psoumas, the Kyparissies and others.

The administrative boundaries of the Agios Athanasios Municipality extend to 1.450,45 hectares. Agios Athanasios is next to the municipalities of Yermasoyia, Limassol and Mesa Gitonia and with the villages of Mathikoloni and Fasoula.

3.2 History

Agios Athanasios has a little history, started from a small rural settlement population grew with the influx of refugees after the 1974 turkish invasion. It is estimated that in Agios Athanasios settled 6.000 refugees. Until then residents engaged in farming and agriculture. Today in the municipality there is the industrial area of Limassol and many hotels.

3.3 Limassol Local Plan

3.3.1 Introduction

The Municipality of Agios Athanasios falls under the Local Plan of Limassol. In Local Plan areas include the municipalities of Limassol, Mesa Gitonia, Agios Athanasios, Kato Polemidia and Yermasoyia, parts of the Community Councils of Agios Tichonas, Parekklesia and Pirgos, Moutagiakka, Moni and Monagroulli and the areas of the Community Councils of Ypsonas, Pano Polemidia and Tserkez Tsiflik, as shown in Figure 10 below.

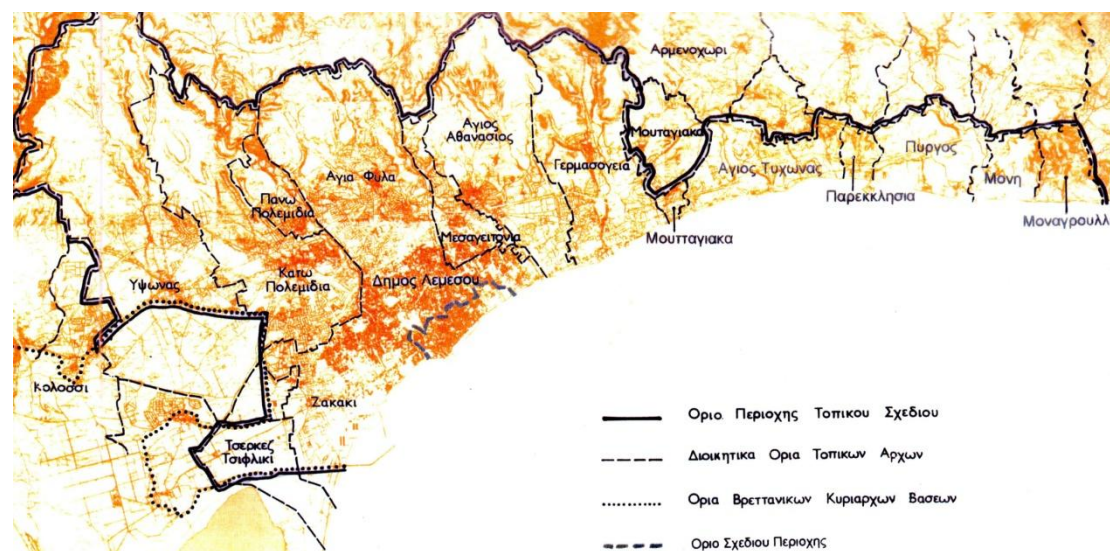


Figure 10 Areas of Limassol Local Plan [Source: Department of Town Planning and Housing 2011]

3.3.2 Structure Development in the Local Plan

The structure of the area under the Local Plan was influenced determinatively by several factors such as the existence of the beach, the old and new harbor. Significant effect on the structure of the development in the Local Plan was also the timeless evolvement of the city and its environs without urban design, land speculation, the shift in tourist arrivals to the sea and the construction of governmental settlements for the accommodation of refugees.

The factors mentioned above had a direct impact in the gradual modulation of the current structure development in the area under the Local Plan, which concisely consists of:

- The formation of a radial road network converging towards the Central Business District, the format of which is determinatively influenced by the features of the area.
- The gathering of most of the urban operations and activities in the Central Business District, while in parallel, mainly during the last years, centrifugal tendencies developed towards the placement of urban land uses and operations longwise essential radial roads and to a lesser degree in the city outskirts and the precinct. This tendencies resulted among other to the interference of incompatible land uses and the traffic burden of some roads beyond their objective limitations.
- The random expansion of the city and the precinct, especially after the intensive building activities that followed the Turkish invasion.
- These areas expanded horizontally and vertically without any substantial town planning scheme, thus creating a group of miscellaneous elements, building intermixtures and dispersed developments.
- The linear touristic development lengthwise the seafront.
- The construction of the new port, which is the biggest and the most modern in Cyprus.
- The construction of Governmental Housing Settlements and Self-Help Housing of Refugees in the city outskirts and the precinct.

The structure of the local area plan needs substantial restructuring, so the urban complex to meet the requirements of modern life, to new realities and the multifunctional role to be played. The restructuring must take heed of the existing features and peculiarities of the project area and especially the fact that Limassol is starting sea transport and the seafront is an integral part of the structure of the wider area of Limassol.

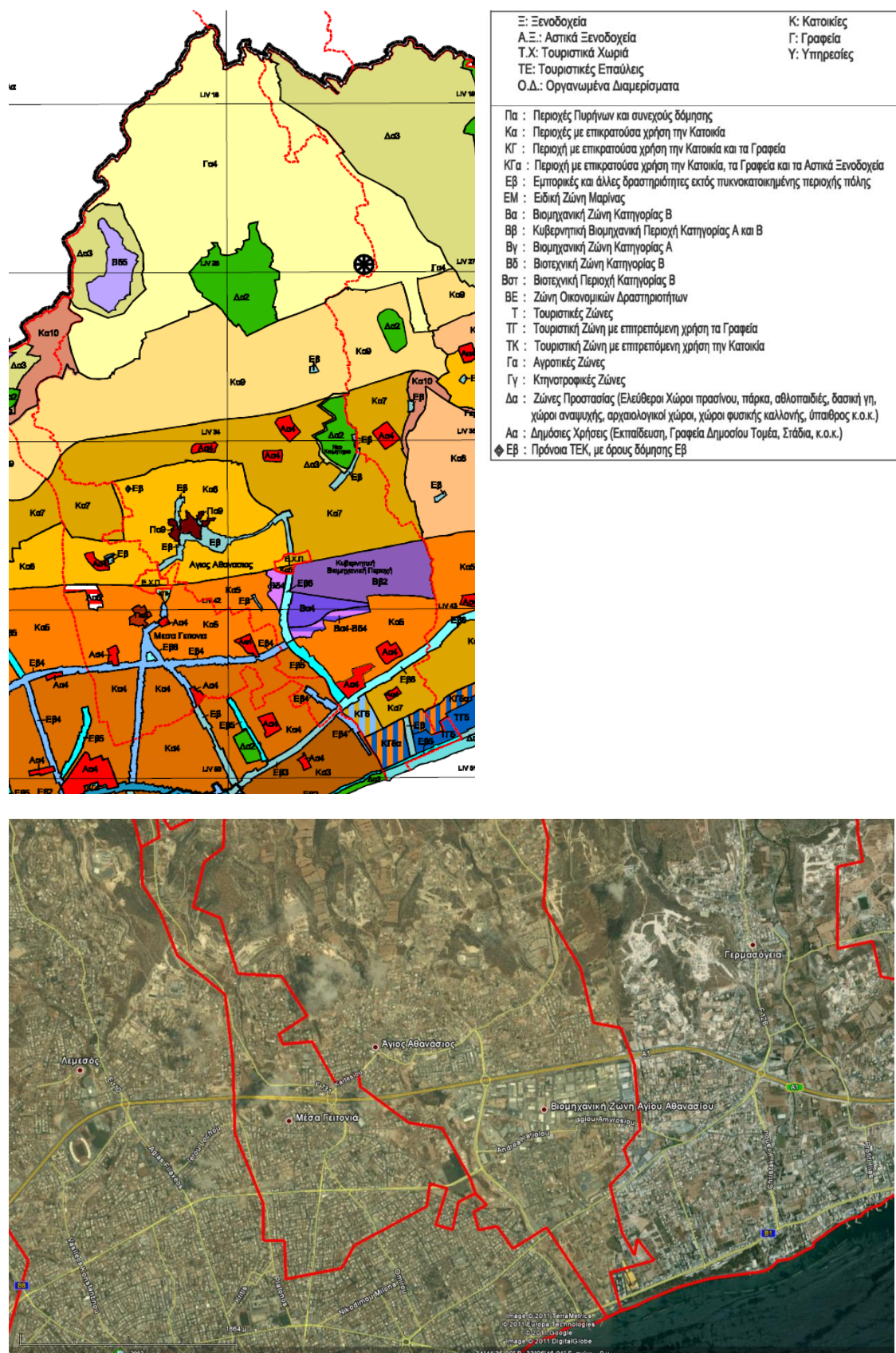


Figure 11 Urban areas in the municipality of Agios Athanasios and satellite photo
 [Source: Department of Town Planning and Housing 2011, google earth]

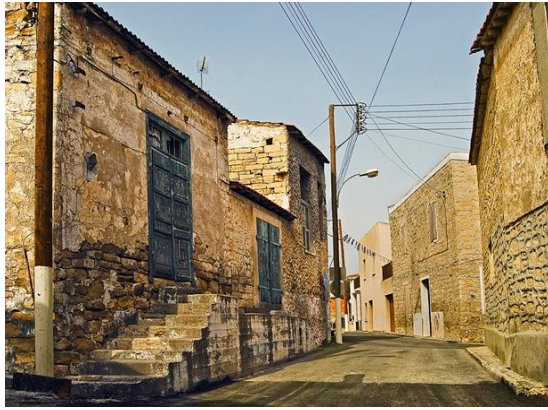


Figure 12 Old Settlement



Figure 13 Agios Athanasios Municipality



Figure 14 Agios Athanasios Roundabout



Figure 15 Town Hall



Figure 16 Central Square



Figure 17 Central Square



Figure 18 Arches

[Source: www.agiosathanasios.org.cy]

4 CURRENT STATUS AT AGIOS ATHANASIOS MUNICIPALITY

4.1 Description of Agios Athanasios Municipality Buildings

Town Hall – year of construction 1995

AREA

Basement:	1726 sq.m.
Ground floor:	970 sq.m.
1st floor:	925 sq.m.
2nd floor:	260 sq.m.
Total	3881 sq.m.

Added area office at the 2nd floor of 125 sq.m.

Multipurpose hall (theater) with capacity 350 seats

The workforce of the building is 28 people

Youth Center of Agios Athanasios village

Area: 340 sq.m.

Cultural Center

Area: 140 sq.m.

Capacity of 40 persons at events

Municipal Library

Area: 105 sq.m.

The electricity consumption recorded for the year 2009 for the municipality buildings are shown below:

Town Hall:	94.730 kWh
Municipal Library:	2.545 kWh
Youth Center:	9.491 kWh
Cultural Center:	3,048 kWh

4.2 Public street lighting of Agios Athanasios Municipality

Public street lighting of Agios Athanasios Municipality consumes 1,9% of electricity consumed in the city. Although it seems to be a small percentage compared to other consumers, is a very significant cost to the budget of the municipality. There are in total 146 counters of road lighting (points which representing a network of road lighting e.g. a street) that for the year 2009 consumed 1.602.893 kWh of electricity.

Note that according to current regulated prices for streetlights, the municipality charged with the following:

- Fixed charge € 4,84 per lamp per two months

- For each supplied kWh € 0,12.

4.3 Lighting of Parks and Public Spaces in Agios Athanasios Municipality

The table below presents the Parks of Municipality and number of lighting used in each. It is also noted that the Parks of Agios Epiktitos, Ioannis Kolokotronis and Karolos Koun use autonomous photovoltaic systems for lighting.

The operating hours of the lamps are 20:00 to 2:00 during the summer and 17:00 to 2:00 during the winter.

Table 1 Parks lighting of Agios Athanasios Municipality

Park	Area	Number of lamps
G.Konstantinou (Paschalis)		6
Commercial Center Lions	Linopetra	9
Lampousas (Voufavento)	Linopetra	8
Trikomou	Linopetra	4
Prousis Kilikias	Linopetra	8
Karpasias-Kantaras	Linopetra	2
Kariolou	Linopetra	3
Kythreas	Linopetra	8
Theofilou Georgiade	Paralia	28
Loudovikou Betoven A	Paralia	6
Loudovikou Betoven B	Paralia	3
Nikou Nikolaide	Agios Athanasios	8
Kokkinogias	Agios Athanasios	15
Kritonos Tornariti	Agios Athanasios	3
Fedia and Polixeni Diamanti	Agios Athanasios	40
Commercial of Agios Athanasios	Agios Athanasios	13
Yianni Ritsou	Agios Athanasios	8
Papoutsas and Thiseos	Agios Athanasios	21
Savva Savva	Agios Athanasios	28
Aimiliou Chourmouzi	Agios Athanasios	6
Apostolou Louka	Agios Athanasios	20
Machiton ELDYK kindergarten	Agios Athanasios	6
Unesco	Agios Athanasios	6
Theotokou Kafkasou	Agios Athanasios	10
Kritonos (impasse)	Agios Athanasios	4
Kosta Monti	Agios Athanasios	4
Apollonos	Agios Athanasios	5
Filikis Eterias (Petrides)	Agios Athanasios	6
Cultural Center of Agios Athanasios	Agios Athanasios	12
Yianni Ritsou (b)	Agios Athanasios	5

Street Filippou Kritioti (Pampakas)	Agios Athanasios	4
Kallitheas (impasse)	Mitropolis Plots	12
Karolou Koun	Mitropolis Plots	9
Steratzia	Chaviara	8

Stadium and sports facilities of the Municipality:

A) Avraam street

4 lighting columns with 2 lamps 400 W each

B) Agios Athanasios high school stadium

4 lighting columns με 6 spotlights per column 2000 W each

C) Youth Center of Agios Athanasios in Machiton ELDYK – 1000 sq.m.

6 lights, 8 (4*2) spotlights.

D) Youth Center of Linopetra – Stadium of Volleyball– 1600 sq.m.

2 lights, 12 spotlights

E) Theotokou and Kafkasou – 2000 sq.m.

10 lights, 4 (250 W) spotlights

4.4 Building permits in the municipality of Agios Athanasios

The number of building permits issued for residences in the municipality:

151 in 2007

194 in 2008

145 in 2009

4.5 Vehicles of Agios Athanasios Municipality

The fleet of vehicles of Agios Athanasios municipality presented in the table below:

Table 2 Vehicle fleet of Agios Athanasios Municipality

VEHICLE	PURCHASE YEAR	MODEL	2005 (€)	2006 (€)	2007 (€)	2008 (€)
HBM748	1999	TRANSPORTATION OF EMPLOYEES	767	878	1.051	1.351
BAP173	1992	GARBAGE TRUCK	7.874	7.306	9.119	11.229
SL550	1986	WATER TANKTRUCK	8.323	65	918	4.952
HTZ567	2002	GARBAGE TRUCK	8.545	8.915	8.145	9.107
KLV176	2005	GARBAGE TRUCK	809	10.307	9.576	13.820
CBA418	1993	VAN	4.179	4.722	4.541	5.387
HTH536	2002	TRUCK	5.456	5.660	4.423	6.611
KKL149	2005	TRANSPORTATION OF EMPLOYEES	617	1.050	814	1.126
KKL815	2005	TRANSPORTATION OF EMPLOYEES	535	730	697	1.159
KNY778	2006	TRANSPORTATION	764	189	1.263	1.355

		OF EMPLOYEES				
DAW924	1994	CLOSED VAN	3.535	897	838	965
EAY374	1995	SWEEPER	0	3.356	2.367	2.930
KRK096	2007	SWEEPER	277	195	1.862	11.917
KEB106	2003	MOTORCYCLE	0	21	18	0
KKE669	2005	MOTORCYCLE	3.557	3.711	0	16
ETK649	1998	DIGGER	1.623	474	3.506	3.880
PN227	1999	WITHDRAWN IN 2007	2.883	3.239	0	0
HXZ554	2002	SALOON	1.201	1.408	2.853	3.666
KKF335	2005	SMALL COMMERCIAL	0	0	1.477	1.719
		TOTAL (€)	50.945	53.122	53.466	81.191
		TOTAL (LITERS)	78.378	75.888	71.288	95.519
		TOTAL (MWh)	912	883	829	1111

4.6 Network of roads and bicycle paths of Agios Athanasios Municipality

The municipality of Agios Athanasios covered by a considerable length of roads and pavements which is approximately 86 km (Figure 20). It should also be noted that the Nicosia-Limassol highway which crosses the municipality, in essence divides the area into northern (core of municipality) and southern part (Paralia and industrial area).

The map below shows the bicycle network in the wider local plan of Limassol. Note that there are studies on implementing bicycle paths on Agios Athanasios Avenue from the traffic lights of Linopetra until the roundabout and the Breastwork of Freedom on the coastal road.

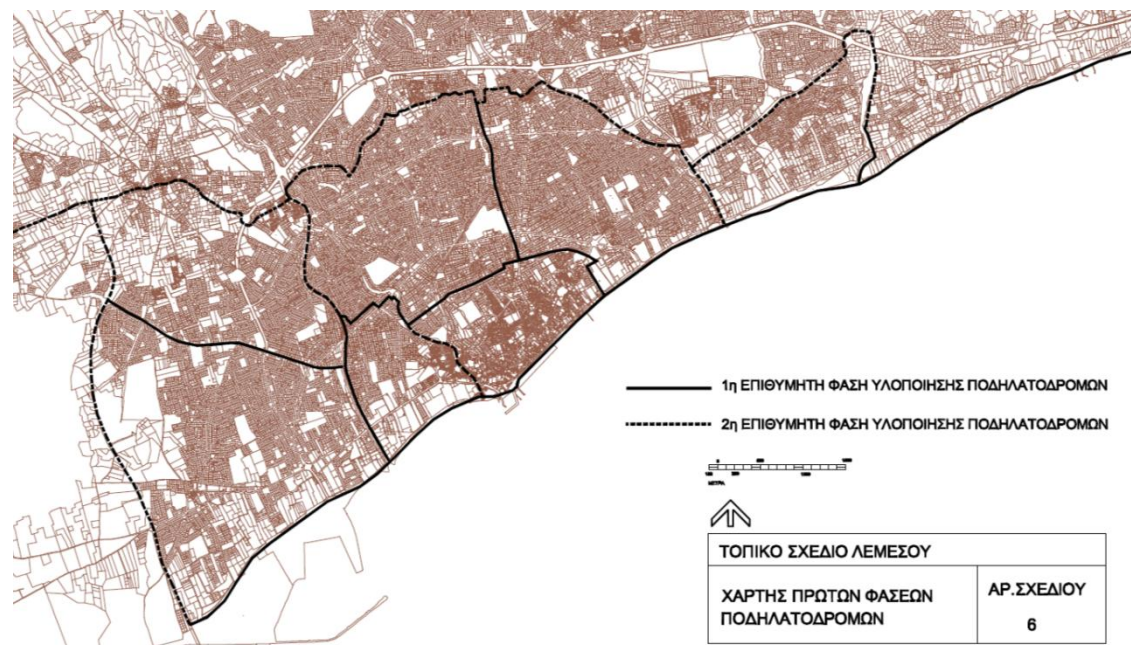


Figure 19 Network of bicycle paths in the local plan of Limassol

[Source: Department of Town Planning and Housing 2011]

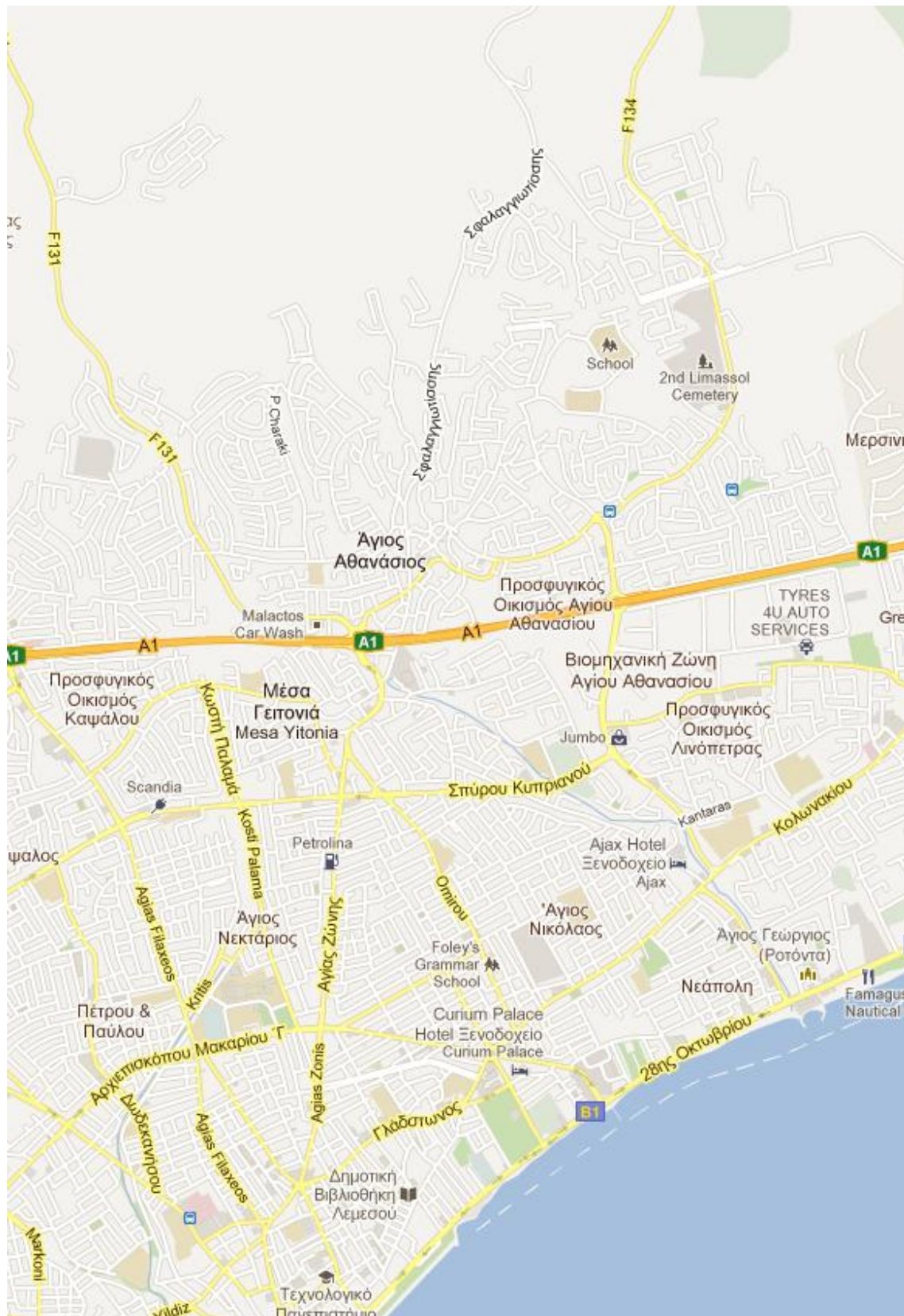


Figure 20 Road network of Agios Athanasios Municipality [Source: Google maps]

The planned road projects which could affect traffic in Agios Athanasios Municipality are the following:

- #### 4.8 Recycle program of Agios Athanasios Municipality

4.9 Number of industries and factories in the Municipality of Agios Athanasios

The table below shows the development of industrial estates in the area.

Year	2005	2006	2007	2008	2009
Number of Industries/Factories	129	132	136	145	147

25

4.10 Number of hotels in the Municipality of Agios Athanasios

Within the administrative boundaries of the municipality hosted only one hotel, the Holiday Inn, which has 144 beds and is located in the beach front.

4.11 Population of Agios Athanasios Municipality

The population of Agios Athanasios according to the census of 2001 was 9.173 residents. Today, the population was estimated at 15.000 people

4.12 Campaigns of environmental awareness

The Municipality of Agios Athanasios in an effort to inform and sensitize the citizens about environmental and energy issues annually performs several actions such as:

- Cycling Day
- Awareness campaigns for recycling
- Informational presentations on energy saving and use of renewable energy sources
- Provision of free parking to hybrid and electric cars


4.13 Green Public Procurement



The Municipality of Agios Athanasios in the invitations for purchase of goods and services promotes green public procurement in fields such as purchasing energy-efficient computers, recycled paper, etc.

4.14 European and International programs

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

Table 3 European projects/initiatives related to Energy and Environment in which the Agios Athanasios Municipality participates

<p>Covenant of Mayors</p> <p>A European Committee initiative for the creation of a permanent collaboration network between European Cities to combat climate change.</p> <p>The municipalities are bound to achieve the European objectives for a reduction of CO2 emissions by at least 20% through measures promoting renewable energy, energy savings and sustainable transport.</p>		<p>www.eumayors.eu</p>
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<p>Covenants of Islands</p> <p>ISLE-PACT aims at developing Sustainable Energy Action Plans in Islands, in order to achieve the European objectives for a reduction of CO2 emissions by at least 20%</p>		<p>www.islepact.eu</p>
<p>Medeea</p> <p>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®</p>		<p>www.interregmedeea.eu</p>

5 Inventory of Energy Consumptions in Agios Athanasios 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	825	722	52	3.351	26	180	5.155
Heating and cooling	19.796	11.808	1.389	104	69	1.737	34.904
Lighting	1.100	-	-	-	-	-	1.100
Kitchen	825	-	354	-	-	-	1.178
Electrical appliances	4.949	-	-	-	-	-	4.949
Total	27.495	12.530	1.794	3.455	95	1.917	47.287

5.2 Primary sector

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

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestry and Fishery	-	-	-	7	17	24
Minning and Quarring	-	-	-	-	-	-
Total	-	-	-	7	17	24

5.3 Secondary sector

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

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Manufacturing	37.305	61	4.194	1.646	549	43.755
Water supply, wastewater treatment, waste management	502	1	82	-	-	586
Construction	96	-	16	-	-	112
Total	37.903	62	4.292	1.646	549	44.453

5.4 Tertiary sector

Table 7 Final Energy Consumption in MWh in the Tertiary Sector in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and retail trade, repair of motor vehicles and motorcycles	7.354	17	1.207	315	105	8.998

Hotels and Restaurants	3.630	9	596	156	52	4.42
Public administration and social insurance	761	2	125	33	11	931
Defense, Justice, Police, and Fire stations/departments	-	-	-	-	-	-
Education	542	1	89	23	8	663
Human Health and Social Care	284	1	47	12	4	347
Other services	4.647	11	762	199	66	5.686
Public lighting	1.603	-	-	-	-	1.603
Total	18.821	41	2.825	738	246	22.671

5.5 Transport

Table 8 Final Energy Consumption in MWh in the Transport in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transport	35	729	1.229	-	1.993
Other passenger transportation services (taxi, tourism, school, buses, etc.)	-	11.670	19.666	627	31.962
Commercial ground transportation services and removable services	-	-	-	-	-
Private vehicles	-	24.069	40.561	1.293	65.922
Total	35	36.468	61.456	1.919	99.878

5.6 Total Final Energy Consumption in the Municipality of Agios Athanasios

Table 9 Final Energy Consumption in MWh in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	27.495	12.530	-	-	1.794	3.455	95	1.917	47.287
Primary	-	-	-	-	7	-	-	17	24
Secondary	37.903	62	-	-	4.292	1.646	-	549	44.453
Tertiary	18.821	41	-	-	2.828	738	-	246	22.671
Transport	35	-	36.468	61.456	-	-	-	1.919	99.878
Total	84.254	12.633	36.468	61.456	8.921	5.839	95	4.648	214.313

Figure 22 Share of Final Energy Consumption by Sector in 2009

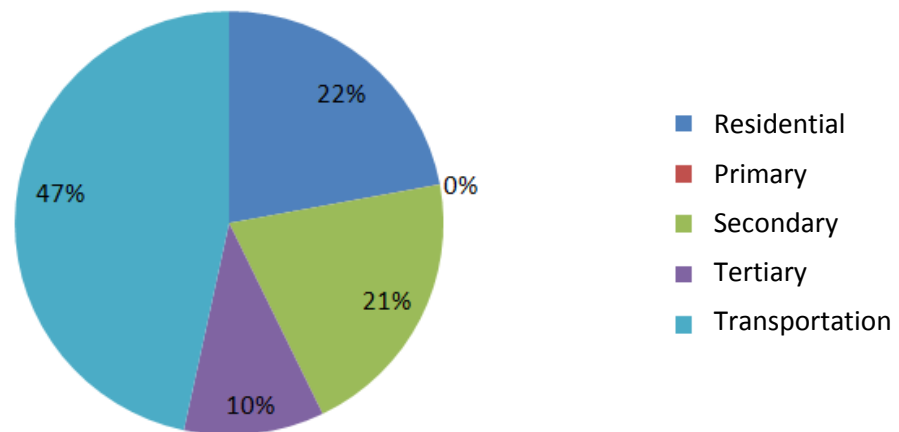
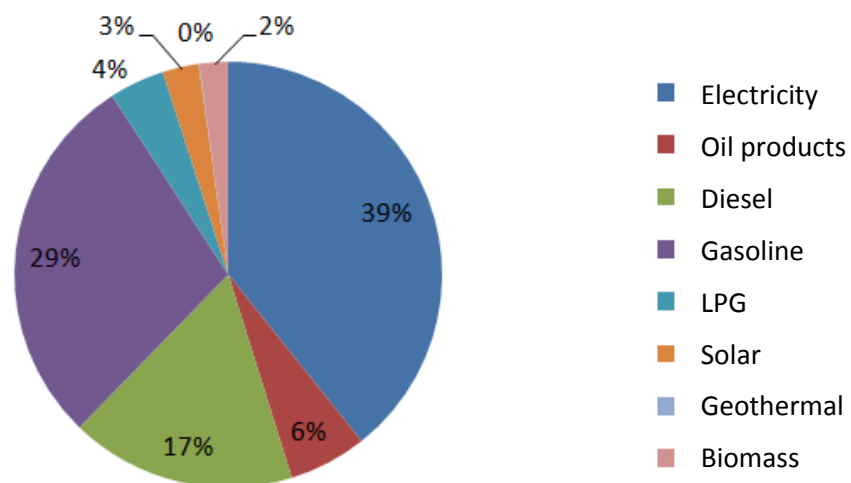


Figure 23 Share of Final Energy Consumption by Energy Source in 2009



6 Inventory of CO₂ emissions at Agios Athanasios 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 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 11 CO₂ emissions in tons in the Residential Sector of Agios Athanasios Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot water	721	201	12	-	-	-	935
Heating and cooling	17.313	3.295	333	-	-	-	20.941
Lighting	962	-	-	-	-	-	962
Kitchen	721	-	85	-	-	-	806
Electrical appliances	4.328	-	-	-	-	-	4.328
Total	24.046	3.496	431	-	-	-	27.973

6.3 Primary sector

Table 12 CO₂ emissions in tons in the Primary Sector of Agios Athanasios Municipality in 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestry and Fishery	-	-	-	2	-	2
Minning and Quarring	-	-	-	-	-	-
Total	-	-	-	2	-	2

6.4 Secondary sector

Table 13 CO₂ emissions in tons in the Secondary Sector of Agios Athanasios Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Manufacturing	32.621	17	1.007	-	-	33.645
Water supply, wastewater treatment, waste management	439	-	20	-	-	459
Construction	84	-	4	-	-	88
Total	33.144	17	1.030	-	-	34.191

6.5 Tertiary Sector

Table 14 CO₂ emissions in tons in the Tertiary sector of Agios Athanasios Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and retail trade, repair of motor vehicles and motorcycles	6.432	5	290	-	-	6.726
Hotels and restaurants	3.175	2	143	-	-	3.320
Public administration and social insurance	666	1	30	-	-	696
Defense, Justice, Police and Fire stations/departements	-	-	-	-	-	-
Education	474	0	21	-	-	496
Human Health and Social Care	248	0	11	-	-	260
Other services	4.064	3	183	-	-	4.250
Public lighting	1.402	-	-	-	-	1.402
Total	16.460	11	678	-	-	17.150

6.6 Transport

Table 15 CO₂ emissions in tons in the Transport of Agios Athanasios Municipality in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and suburban passenger transport	30	195	306	-	531
Other passenger transportation services (taxi, tourism, school, buses, etc.)	-	3.116	4.897	-	8.013
Commercial ground transportation services and mobile services	-	-	-	-	-
Private vehicles	-	6.426	10.100	-	16.526
Total	30	9.737	15.303	-	25.070

6.7 Total CO₂ emissions in Agios Athanasios Municipality

Table 16 CO₂ emissions in tons of Agios Athanasios Municipality in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Geothermal	Biomass	Total
Residential	24.046	3.496	-	-	431	-	-	-	27.973
Primary	-	-	-	-	2	-	-	-	2
Secondary	33.144	17	-	-	1.030	-	-	-	34.191
Tertiary	16.460	11	-	-	678	-	-	-	17.150
Transport	30	-	9.737	15.303	-	-	-	-	25.070
Total	73.680	3.524	9.737	15.303	2.141	0	0	0	104.386

Figure 24 Share of CO₂ emissions by sector in Agios Athanasios Municipality in 2009

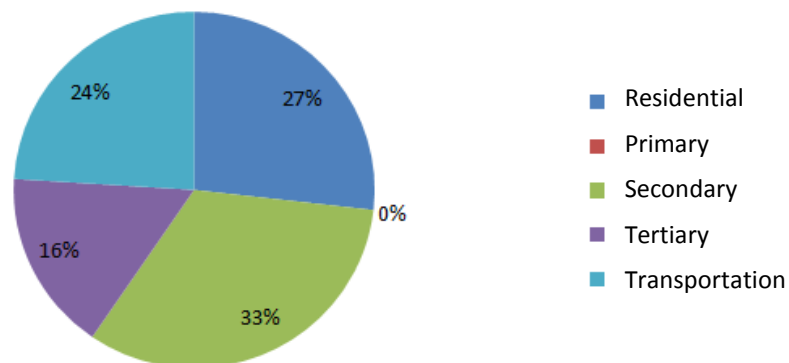
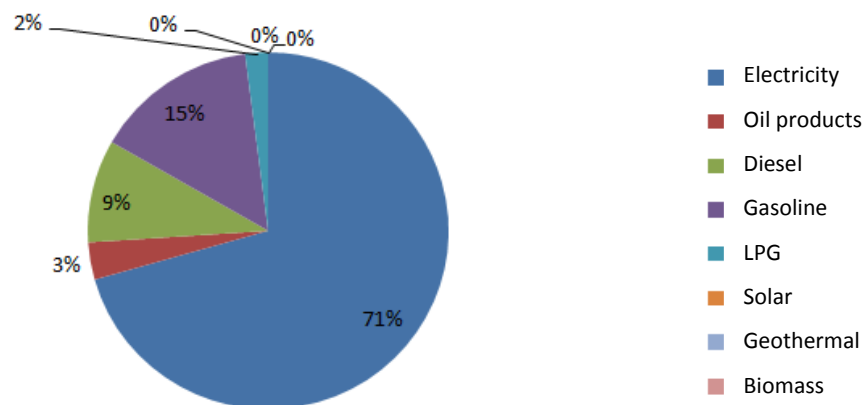


Figure 25 Share of CO₂ emissions by Energy Source in Agios Athanasios Municipality in 2009



6.8 Forecasting scenario of CO₂ emissions

For the forecasting/projection of CO₂ 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 Description	Estimate annual energy consumption rate
Residential	
Hot water	3,0%
Heating and cooling	3,0%
Lighting	3,0%
Cooking	3,0%
Refrigerators and freezers	3,0%
Washing and dry machines	3,0%
Dishwashers	3,0%
Televisions	3,0%
Other electrical appliances	3,0%
Primary Sector	
Agriculture, Forestry and Fishery	1,0%
Minning and Quarring	0,0%
Secondary Sector	
Manufacturing	3,0%
Water supply, waste water treatment, waste management and remediation activities	1,0%
Construction	2,5%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	2,5%
Accommodation and food services	2,5%
General public administration and social insurance	1,0%
Defense and justice services, police and fire stations/departments	0,5%
Education	1,5%
Activities related to human health and social care	1,5%
Other services	2,5%

Municipal/Public lighting	2,5%
Transport (vehicles)	
Private transport	1,0%
Urban and suburban passenger transport	2,0%
Other road transport services (taxi, tourism, school buses, etc.)	0,0%
Freight road transports and removal services	3,0%
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	1,0%

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

Sector Description	Estimated annual energy consumption rate
Residential	
Hot water	0,5%
Heating and cooling	0,5%
Lighting	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%
Transport (vehicles)	
Private transport	0,5%

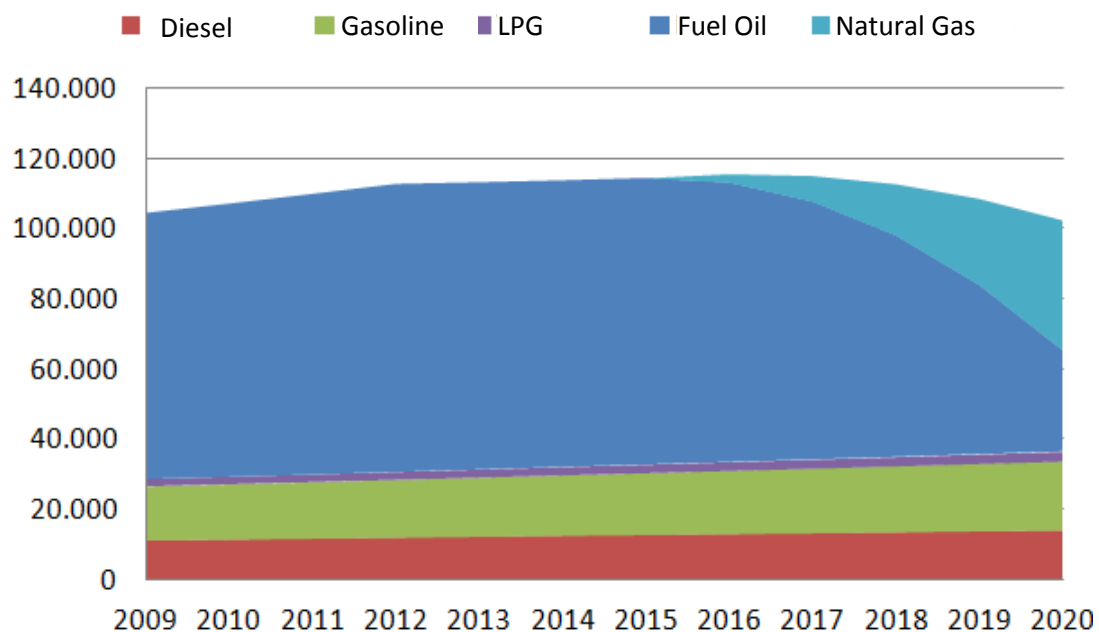
Table 19 Coefficients of Energy Performance of Electricity Generation

	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 CO2 Emissions for the Period 2009 - 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Percentage increase based on 2009
2009	75.939	10.997	15.303	2.140	0	104.379	0%
2010	77.933	11.254	15.655	2.198	0	107.039	-3%
2011	80.018	11.518	16.015	2.257	0	109.808	-5%
2012	82.160	11.788	16.383	2.317	0	112.649	-8%
2013	81.923	12.065	16.761	2.380	0	113.128	-9%
2014	81.762	12.348	17.147	2.443	0	113.701	-9%
2015	81.724	12.582	17.542	2.509	0	114.357	-10%
2016	79.777	12.823	17.946	2.577	2.427	115.550	-11%
2017	73.639	13.073	18.360	2.646	7.313	115.031	-10%
2018	63.200	13.330	18.783	2.717	14.691	112.722	-8%
2019	48.341	13.596	19.217	2.790	24.594	108.538	-4%
2020	28.942	13.870	19.660	2.865	37.056	102.393	2%

Figure 26 Expected Evolution Scenario for Forecasting CO2 Emissions for the Period 2009 -2020



7 Agios Athanasios Municipality Sustainable Energy Action Plan from 2011 to 2020

7.1 Introduction

The Sustainable Energy Action Plan that has been prepared for Agios Athanasios 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.

Emissions Reference Year 2009 (tn CO ₂ /year)	Expected annual emissions in 2020 (tn CO ₂ /year)	Emissions target 2020 (tn CO ₂ /year)	Desired minimum (20%) emissions reduction (tn CO ₂ /year)
104.379	102.393	83.503	18.889

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 – Improving thermal behavior of the Town Hall

Building Description	
Construction Year:	1995
Building Area	Basement 1726 m ² Ground floor 970 m ² 1 st floor 925 m ² 2 nd floor 260 m ²
Uses	Offices where 28 people work Multifunction Hall cap. 350 people
Energy Consumption	95.000 kWh/year

Assessed: (a) roof insulation, (b) wall thermal insulation (c) openings 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.

Measure implementation in 2012

Measure code	ENEf1		
Measure name	Improving thermal behavior of the Town Hall		
APPLICATION COST			
Investment cost	Area (m²)	Cost (€/m²)	Total (€)
(a) Roof insulation (without sponsorship)	970	15 €/m ² _{roof}	14.550
(b) Wall insulation (without sponsorship)	910	45 €/m ² _{wall}	40.950
(c) Openings replacement (without sponsorship)	230	100 €/m ² _{window}	23.000
Operation cost			
(a) Roof insulation	0 €		
(b) Wall insulation	0 €		
(c) Openings replacement	0 €		
Indirect cost			
	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Heated Area (m²)	Benefit (kWh/m² year)	Energy saving (kWh/year)
(a) Roof insulation (without sponsorship)	2000	10	20.000
(b) Wall insulation (without sponsorship)	2000	6.3	12.600
(c) Openings replacement (without sponsorship)	2000	3.2	6.400
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
(a) Roof insulation	20.000	0.13	2600
(b) Wall insulation	12.600	0.13	1638
(c) Openings replacement	6.400	0.13	832
Environmental	Coefficient of emissions reduction (kgCO₂/m² year)	Heated Area (m²)	Emissions reduction (kgCO₂/ year)
(a) Roof insulation	5.1	2000	10.200
(b) Wall insulation	3.4	2000	6.800
(c) Openings replacement	1.7	200	3.400
RESULTS – EVALUATION			
Unit cost (€/kg CO ₂)			Proposed for implementation
(a) Roof insulation	1.42 €/ kgCO ₂ annual saving		<input checked="" type="checkbox"/>
(b) Wall insulation	6.02 €/ kgCO ₂ annual saving		<input type="checkbox"/>
(c) Openings replacement	6.76 €/ kgCO ₂ annual saving		<input type="checkbox"/>
MEASURE TO BE IMPLEMENTED ENEf1(a) Roof insulation of the Town Hall			
Total cost 14.550 €	Saving 2.600 €	Emissions reduction 10.200 KgCO ₂ / year	Depreciation 5.6 years

Measure ENEF 2 – Improving thermal behavior of the Youth Center

Building Description	
Building Area	340 m ²
Uses	Youth Center
Energy consumption	9.500 kWh/year

Assessed the roof 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 tenders by technical and financial criteria.

Measure implementation period: 2012

Measure Code	ENE2		
Measure Name	Improving thermal behavior of the Youth Center		
APPLICATION COST			
Investment Cost	Area (m ²)	Cost (€/m ²)	Total (€)
Roof insulation (without sponsorship)	340	15 €/m ² _{roof}	5.100
Operation cost			
Roof insulation	0 €		
Indirect cost			
Roof insulation	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Heated Area (m ²)	Benefit (kWh/m ² year)	Energy Saving (kWh/year)
Roof insulation	340	6	2.040
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
Roof insulation	2.040	0.13	265
Environmental	Coefficient of emissions reduction (kg _{CO2} /m ² _{th,x} ·year)	Thermal area (m ²)	Emissions reduction (kg _{CO2} / year)
Roof insulation	3.2	340	1.088
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)			Proposed for implementation
Roof insulation	4.68 €/ kg_{CO2} annual saving		<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED ENE2 Roof insulation of the Town Hall			
Total cost 2.040 €	Saving 265 €	Emissions reduction 1.088 Kg_{CO2}/ year	Depreciation 7.7 years

Measure ENEF 3 – Improving thermal behavior of the Municipal Library

Building Description	
Building Area	105 m ²
Uses	Library
Energy consumption	2.600 kWh/year

Assessed the roof 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 tenders by technical and financial criteria.

Measure implementation period: 2012

Measure Code	ENE3		
Measure Name	Improving thermal behavior of the Municipal Library		
APPLICATION COST			
Investment Cost	Area (m ²)	Cost (€/m ²)	Total (€)
Roof insulation (without sponsorship)	105	15 €/m ² _{roof}	1.575
Operation Cost			
Roof insulation	0 €		
Indirect Cost			
Roof insulation	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Heated area (m ²)	Benefit (kWh/m ² year)	Energy saving (kWh/year)
Roof insulation	105	5.4	567
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
Roof insulation	567	0.13	74
Environmental	Coefficient of emissions reduction (kg _{CO2} /m ² year)	Heated area (m ²)	Energy reduction (kg _{CO2} / year)
Roof insulation	2.86	105	300
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)	Proposed for Implementation		
Roof insulation	5.25 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED ENE3 Roof insulation of the Municipal Library			
Total cost 1575 €	Saving 74 €	Emissions reduction 300 Kg _{CO2} / year	Depreciation 21 years

Measure ENEF 4 – Improving thermal behavior of the Cultural Center

Building Description	
Building area	140 m ²
Uses	Cultural Center
	Capacity 40 people
Energy consumption	3.050 kWh/year

Assessed the roof 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 tenders by technical and financial criteria.

Measure implementation period: 2012

Measure Code	ENE4		
Code Name	Improving thermal behavior of the Cultural Center		
APPLICATION COST			
Investment cost	Area (m ²)	Cost (€/m ²)	Total (€)
Roof insulation (without sponsorship)	140	15 €/m ² _{roof}	2.100
Operation cost			
Roof insulation	0 €		
Indirect cost			
Roof insulation	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Heated area (m ²)	Benefit (kWh/m ² year)	Energy saving (kWh/year)
Roof insulation	140	4.7	658
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
Roof insulation	658	0.13	86
Environmental	Coefficient of emissions reduction (kg _{CO2} /m ² year)	Heated area (m ²)	Emissions reduction (kg _{CO2} /year)
Roof insulation	2.51	140	351
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)	Proposed for Implementation		
Roof insulation	5.98 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED ENE4 Roof insulation of the Cultural Center			
Total cost 2.100 €	Saving 86 €	Emissions reduction 351 Kg _{CO2} / year	Depreciation 24 years

Measure ENEF5: Energy Saving in the Town Hall

Building Description

Energy consumption 95.000 kWh/year

Assessed: (a) installation of voltage corrector and (b) conventional bulbs replacing.

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 tenders by 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.

Measure implementation period: 2012

Saving systems receive a grant of 30%.

Measure Code	ENE5		
Measure Name	Energy saving in the Town Hall		
APPLICATION COST			
Investment cost	Total (€)		
(a) Voltage corrector (without sponsorship)	22.000		
(b) Bulbs replacing (without sponsorship)	1.000		
Operation cost			
(a) Voltage corrector	0 €		
(b) Bulbs replacing	0 €		
Indirect cost			
	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Area (m ²)	Benefit (kWh/m ² .year)	Energy saving (kWh/year)
(a) Voltage corrector	2.155	4.4	9.500
(b) Bulbs replacing	2.155	0.9	1.940
Financial	Energy saving (kWh/year)	Average electricity price (€/kWh)	Saving (€/year)
(a) Voltage corrector	9500	0.13	1.235
(b) Bulbs replacing	1.940	0.13	252
Environmental	Coefficient of emissions reduction (kg _{CO2} /m ² .year)	Area (m ²)	Emissions reduction (kg _{CO2} / year)
(a) Voltage corrector	3.8	2155	8.189
(b) Bulbs replacing	0.7	2155	1.508
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)			Proposed for Implementation
(a) Voltage corrector	2.68 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>
(b) Bulbs replacing	0.66 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED ENEF5(a), ENEF5(b) Energy saving in the Town Hall			
Total cost 23.000 €	Saving 1487 €	Emissions reduction 9.697 Kg _{CO2} / year	Depreciation 6,4 years

Measure ENEF6: Renewable Electricity from Photovoltaic Systems on the Town Hall

The installation of electricity generating systems with Photovoltaic panels was studied. 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 tenders by specific technical and financial criteria, (c) completion of form (application) to ensure the subsidy from the 2009-2013 Grant Scheme of the Ministry of Commerce, Industry and Tourism. Additionally, the process of connecting the PV systems with the electricity network grid of EAC should be performed.

Measure implementation period: 2012

Photovoltaic Systems receive a subsidy on the sold kWh (selling price is €0,34)

Measure Code	ENE6		
Measure Name	Renewable electricity on the Town Hall		
APPLICATION COST			
Investment Cost	Total (€)		
Photovoltaic Systems 20 kW (without sponsorship)	50.000		
Operation Cost			
Photovoltaic System 20 kW	0 € (negligible cost for the periodical cleaning of the frames)		
Indirect Cost			
	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Average <input type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Power (kW)	Electricity generation (kWh/kW.year)	Green Energy (kWh/year)
Photovoltaic System 20 kW	20	1500	30.000
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	Income (€/year)
Photovoltaic System 20 kW	30.000	0.34	10.200
Environmental	Coefficient of emissions reduction (kg _{CO2} /kW.year)	Power (kW)	Emissions reduction (kg _{CO2} / year)
Photovoltaic System 20 kW	1.183	20	23.670
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)		Προτείνεται για υλοποίηση	
Photovoltaic System 20 kW	2.32 €/ kg _{CO2} annual saving	<input checked="" type="checkbox"/>	
MEASURE TO BE IMPLEMENTED ENE6 Renewable electricity on the Town Hall			
Total cost 50.000 €	Income 10.200 €	Emissions reduction 23.670 Kg _{CO2} / year	Depreciation 4,9 years

7.3 Energy Saving through awareness raising campaigns

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

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

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

Measure implementation period: 2012 - 2014

Measure Code	ESAC1	
Measure Name	Organization of an annual seminar on Renewable Energy Sources	
APPLICATION COST		
Cost of measure	3.000 €	
Indirect cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	270.000 kWh/year	
Financial (Green en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	213.030 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.014€/ kg _{CO2} annual saving	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%)
$v\delta$: number of diffuse influence
ESPP: Green Energy per person (kWh)
Calculation:
$ES = 100 * 3 * 0.3 * 3 * 1000 \text{ kWh/year} = 270.000 \text{ kWh/year}$

Measure ESAC2: Organization of an annual seminar on Renewable Energy Sources

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

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

Measure implementation period: 2012 - 2014

Measure Code	ESAC2	
Measure Name	Organization of annual seminar on Energy Saving	
APPLICATION COST		
Cost of measure	3.000 €	
Indirect cost	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	157.500 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	101.917 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.029€/ kg _{CO2} annual saving	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:
$ES = 100 * 3 * 0.25 * 3 * 700 \text{ kWh/year} = 157.500 \text{ kWh/year}$

Measure ESAC3: Organization of an annual seminar on Energy Saving in Industry

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

Considered to promote cogeneration systems.

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 at home on their own.

Implementation years 2011, 2013, 2015

Measure Code	ESAC3	
Measure Name	Organization of annual seminar on Energy Saving in Industry	
APPLICATION COST		
Cost of measure	4.500 €	
Indirect cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	725.625 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	469.547 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.001€/ kg _{CO2} annual saving	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%)
$v\delta$: number of diffuse influence
ESPP: Green Energy per person (kWh)
Calculation:
$ES = 50 * 3 * 0.5 * 1.5 * 6450 \text{ kWh/year} = 725.625 \text{ kWh/year}$

Measure ESAC 4: Organization of “Renewable Energy Sources (RES) and Energy Saving (ES)” Day

The organization of an annual day of Renewable Energy Sources and Energy Saving in Agios Athanasios Municipality was examined. The measure will apply for a period of 10 years.

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

Implementation years 2010-2020

Measure Code	ESAC4	
Measure Name	Organization of “Renewable Energy Sources (RES) and Energy Saving (ES)” Day	
APPLICATION COST		
Cost of Measure	10.000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	720.000 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	465.907 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.021€/ kg _{CO2} annual saving	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%)
$v\delta$: number of diffuse influence
ESPP: Green Energy per person (kWh)
Calculation:
$ES = 200 * 10 * 0.2 * 3 * 600 \text{ kWh/year} = 720.000 \text{ kWh/year}$

Measure ESAC5: 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 ten (10) 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.

Implementation years 2010, 2012, 2014, 2016, 2018

Measure Code	ESAC5	
Measure Name	Organization of educational presentations to students	
APPLICATION COST		
Cost of Measure	3.000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	1.440.000 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	931.815 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.005€/ kg _{CO2} annual saving	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%)
$v\delta$: number of diffuse influence
ESPP: Green Energy per person (kWh)
Calculation:
$ES = 200 * 10 * 0.4 * 3 * 600 \text{ kWh/year} = 1.440.000 \text{ kWh/year}$

Measure ESAC6: Organization of “Day without lighting”

The organization of an annual day without lighting in Agios Athanasios Municipality was examined. The measure will apply for a period of 10 years.

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

Implementation years 2011 - 2020

Measure Code	ESAC6	
Measure Name	Organization of “Day without lighting”	
APPLICATION COST		
Cost of Measure	1500 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	180.000 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	116.477 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.013€/ kg _{CO2} annual saving	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: $ES = 1500 * 10 * 0.05 * 3 * 80 \text{ kWh/year} = 180.000 \text{ kWh/year}$

Measure ESAC7: Information about energy in the Municipality website and newspaper

The posting of information on Renewable Energy Sources (RES) and Energy Saving (ES) in the Municipality of Agios Athanasios website was examined. In addition, there will be a special article on energy in the Municipality quarterly newspaper. The measure will apply for a period of 10 years.

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

Implementation years 2010 - 2020

Measure Code	ESAC7	
Measure Name	Energy Information in the Municipality website and newspaper	
APPLICATION COST		
Cost of Measure	0 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	450.000 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	291.192 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.00 €/ kg _{CO2} annual saving	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: $ES = 200 * 10 * 0.15 * 3 * 500 \text{ kWh/year} = 450.000 \text{ kWh/year}$

Measure ESAC8: Free consulting services to citizens from Municipality Officers

The possibility of providing free consulting services to the citizens from Municipal Officers was examined. The measure will apply for 3 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.

Implementation years 2011 - 2013

Measure Code	ESAC8	
Measure Name	Free consulting services to the citizens from Municipal Officers	
APPLICATION COST		
Cost of Measure	6000 €	
Indirect Cost	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	1.215.000 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties	
Environmental (kg CO ₂ -eq)	786.219 kg _{CO2} /year	
RESULTS - EVALUATION		
<u>Unit cost</u> (€/kg CO ₂)	0.008 €/ kg _{CO2} annual saving	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%)
$v\delta$: number of diffuse influence
ESPP: Green Energy per person (kWh)
Calculation:
$ES = 100 * 3 * 0.75 * 3 * 1800 \text{ kWh/year} = 1.215.000 \text{ kWh/year}$

Measure ESAC9: Organization of "Cycling Day"

The organization of an annual "Cycling Day" in Agios Athanasios Municipality was examined. The measure will apply for 10 years.

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

Implementation years 2010 - 2020

Measure Code	ESAC9	
Measure Name	Organization of “Cycling Day”	
APPLICATION COST		
Cost of Measure	2000 €	
Indirect Cost	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	552.600 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties in terms of fuel saving	
Environmental (kg CO ₂ -eq)	357.584 kg _{CO2} /year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.006€/ kg _{CO2} annual saving	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: $ES = 100 * 10 * 0.2 * 3 * 921 \text{ kWh/year} = 552.600 \text{ kWh/year}$

Measure ESAC10: Organization of "Eco-cars Day"

The organization of "Eco-cars Day" in Agios Athanasios Municipality was examined. The measure will be held annually for 2 consecutive years.

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

Implementation years 2011 and 2013

Measure Code	ESAC10	
Measure Name	Organization of "Eco-cars Day"	
APPLICATION COST		
Cost of Measure	1000 €	
Indirect Cost	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Average <input type="checkbox"/> – Low	
APPLICATION BENEFITS		
Energy	276.300 kWh/year	
Financial (Saving en. €/year)	The financial benefits for interested parties in terms of fuel saving	
Environmental (kg CO ₂ -eq)	69.793 kg_{CO2}/year	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)	0.014€/ kg_{CO2} annual saving	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: $ES = 100 * 2 * 0.05 * 3 * 9210 \text{ kWh/year} = 276.300 \text{ kWh/year}$

Measure ESAC11: Raising awareness through 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: 2012-2020

Measure Code	ESAC11			
Measure Name	Informational leaflets and messages			
APPLICATION COST				
Measure cost	Total (€)			
(a) Leaflets on RES and ES	2000 €			
(b) Leaflets on sustainable mobility	2000 €			
(c)Articles in the Municipality's Newspaper	0 €			
(d) TV Spots	5000 €			
(e) Radio Spots	3000 €			
Indirect cost				
	<input checked="" type="checkbox"/> – High <input type="checkbox"/> – Average <input type="checkbox"/> – Low			
APPLICATION BENEFITS				
Energy	Number/ receivers	Awareness Percentage	Energy Benefit (kWh/person.year)	Energy Saving (kWh/year)
(a) Leaflets on RES and ES	10.000	5%	1100	550.000
(b) Leaflets on sustainable mobility	10.000	5%	2210	110.500
(c)Articles in the Municipality's Newspaper	10.000	2%	900	220.000
(d) TV Spots	4.000	4%	1100	176.000
(e) Radio Spots	4.000	3%	1000	120.000
Financial				
	The financial benefits for interested parties in terms of energy saving			
Environmental	Emissions reduction (kg _{CO2} / year)			
(a) Leaflets on RES and ES	355.901			
(b) Leaflets on sustainable mobility	279.174			
(c)Articles in the Municipality's Newspaper	142.361			
(d) TV Spots	113.888			
(e) Radio Spots	77.651			

RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)		Proposed for Implementation
(a) Leaflets on RES and ES	0.006 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(b) Leaflets on sustainable mobility	0.007 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(c) Articles in the Municipality's Newspaper	0 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(d) TV Spots	0.044 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
(e) Radio Spots	0.039 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED ESAC11(a),(b),(c),(d),(e) Informational leaflets and messages		
Total cost 12.000 €		Emissions reduction 968.975 Kg_{CO2}/ year

7.4 Energy Saving in Transport

Measure EST1: Energy saving in transports by promoting eco-cars (hybrid and electric)

The possibility of the promotion of vehicles with low CO₂ emissions by providing facilities was examined. Two cases were examined: (a) free parking space and (b) charging points for electric vehicles. The facilities should be provided for 5 years.

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

Measure Implementation Period: 2010-2014

Measure Code	EST1			
Measure Name	Promotion of vehicles with low CO₂ emissions			
APPLICATION COST				
Measure cost	Total (€)			
(a) Free Parking Spaces (10 spaces)	15.000 € * loss of income			
(b)Charging points for electric vehicles (5 points)	2500 €			
Indirect cost				
	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low			
APPLICATION BENEFITS				
Energy	Number of spaces	Traffic (4 years)	ES per visit + ES from diffuse information (kWh/ year)	Energy Saving (kWh/year)
(a) Free Parking Spaces (10 spaces)	10	14.600	70	1.022.000
(b)Charging points for electric vehicles (5 points)	5	1825	80	584.000
Financial				
	The financial benefits for interested parties from ES			
Environmental	Emissions saving (kg _{CO2} / year)			
(a) Free Parking Spaces (10 spaces)	258.157			
(b)Charging points for electric vehicles (5 points)	147.518			
RESULTS - EVALUATION				
Unit cost (€/kg CO ₂)			Proposed for Implementation	
(a) Free Parking Spaces (10 spaces)	0.058 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>	
(b)Charging points for electric vehicles (5 points)	0.017 €/ kg _{CO2} annual saving		<input checked="" type="checkbox"/>	
MEASURE TO BE IMPLEMENTED EST1(a),(b) Promotion of vehicles with low CO₂ emissions				
Total cost 17.500 €		Emissions reduction 405.675 Kg_{CO2}/ year		

Measure EST2: 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 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: 2016 – 2020

Measure Code	EST2	
Measure Name	Energy saving in the Municipality's fleet	
APPLICATION COST		
Measure cost	Total (€)	
Purchase of 2 eco-cars	30.000 €	
Indirect cost		
	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – 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		
Unit cost (€/kg CO ₂)		Proposed for Implementation
Purchase of 2 eco-cars	6.447 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>
MEASURE TO BE IMPLEMENTED EST2 Energy saving in the Municipality's fleet		
Total cost 30.000 €	Emissions reduction 4.653 Kg_{CO2}/ year	

7.5 Energy Saving in Street Lighting

Measure ESSL1: Energy Saving in Street Lighting

The possibility of energy saving in street lighting was examined. Street lighting is one of the major expenses of the Municipality. The electricity consumption for street lighting in Agios Athanasios Municipality in 2009 was 1.637.000 kWh.

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

The indirect application cost can be considered low.

Year of Measure Implementation: 2013

Measure Code	ESSL1			
Measure Name	Energy Saving in Street Lighting			
APPLICATION COST				
Measure cost	Total (€)			
(a) Replacement of current lamps with economic LED lamps	60.000 €			
(b) Optimization of Street Lighting operation hours	5.000 €			
Indirect cost	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low			
Maintenance Cost	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – 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	500	800	60	240.000
(b) Optimization of Street Lighting operation hours	500	800	5	40.000
Financial	Energy Saving (kWh/year)	Average Electricity Price (€/kWh)		Saving (€/year)
(a) Replacement of current lamps with economic LED lamps	240.000	0.13		31.200
(b) Optimization of Street Lighting operation hours	40.000	0.13		5.200
Environmental	Emissions Saving year)			
(a) Replacement of current lamps with economic LED lamps	189.360			
(b) Optimization of Street Lighting operation hours	31.560			

RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)		Proposed for implementation	
(a) Replacement of current lamps with economic LED lamps	0.317 €/ kg _{CO2} annual saving	<input type="checkbox"/>	
(b) Optimization of Street Lighting operation hours	0.158 €/ kg _{CO2} annual saving	<input type="checkbox"/>	
MEASURE TO BE IMPLEMENTED ESS1(a),(b) Energy Saving in Street Lighting			
Total cost 65.000 €	Saving 36.400 €	Emissions Reduction 220.920 Kg _{CO2} / year	Depreciation 1.8 years

7.6 Investments of Agios Athanasios Municipality in RES

Measure RES1: Investments of Larnaka Municipality in Renewable Electricity

The creation of a Photovoltaic Park 150kW and two small wind turbines with total power 10kW 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 €0,31). Small wind turbines receive a grant of 55% of the cost of the Grant Scheme 2009-2013 of Ministry of Commerce, Industry and Tourism.

Years of Implementation Measure: 2012 and 2013

Measure Code	RES1		
Measure Name	Renewable Electricity with Photovoltaic Systems and Small Wind Turbines		
APPLICATION COST			
Investment Cost	Total (€)		
(a) Photovoltaic Park 150 kW	350.000		
(b) Small Wind Turbines 10 KW (without sponsorship)	15.000		
Operational Cost			
(a) Photovoltaic Park 150 kW	0 € (negligible cost for the periodical cleaning of the frames)		
(b) Small Wind Turbines 10 KW	250 € per year maintenance		
Indirect cost			
	<input type="checkbox"/> – High <input checked="" type="checkbox"/> – Average <input type="checkbox"/> – Low		
APPLICATION BENEFITS			
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	Green Energy (kWh/year)
(a) Photovoltaic Park 150 kW	150	1500	225.000
(b) Small Wind Turbines 10 KW	10	1300	13.000
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	Income (€/year)
(a) Photovoltaic Park 150 kW	225.000	0.31	69.750
(b) Small Wind Turbines 10 KW	13.000	0.13	1.690
Environmental	Emissions Saving (kg _{CO2} / year)		
(a) Photovoltaic Park 150 kW	177.525		
(b) Small Wind Turbines 10 KW	10.257		
RESULTS - EVALUATION			
Unit cost (€/kg CO ₂)		Proposed for Implementation	
(a) Photovoltaic Park 150 kW	2.535 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>	
(b) Small Wind Turbines 10 KW	1.462 €/ kg_{CO2} annual saving	<input checked="" type="checkbox"/>	
MEASURE TO BE IMPLEMENTED RES1 Renewable Electricity with Photovoltaic Systems and Small Wind Turbines			
Total cost 365.000 €	Income 71.440 €	Emissions reduction 187.782 Kg_{CO2}/ year	Depreciation 5,1 years

7.7 Development of Green Spaces in Agios Athanasios Municipality

Measure DGS1: Development of green spaces Regarding the development of green spaces in Agios Athanasios 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	DGS1	
Measure Name	Development of green spaces in Agios Athanasios Municipality	
APPLICATION COST		
Measure cost	Total (€)	
<i>(a) Planting of trees (2000 trees)</i>	3000 €	
<i>(b) Care of Green Spaces</i>	8000 €	
Indirect cost		
	<input type="checkbox"/> – High <input type="checkbox"/> – Average <input checked="" type="checkbox"/> – Low	
APPLICATION BENEFITS		
Environmental	Emissions Saving (kg _{CO2} / year)	
<i>(a) Planting of trees (2000 trees)</i>	60.000	
<i>(b) Care of Green Spaces</i>	30.000	
RESULTS - EVALUATION		
Unit cost (€/kg CO ₂)		Proposed for Implementation
<i>(a) Planting of trees (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 BE IMPLEMENTED DGS1(a),(b) Development of green spaces in Agios Athanasios Municipality		
Total cost 11.000 €	Emissions Reduction 90.000 Kg _{CO2} / year	

7.8 Summary of Measures of Agios Athanasios Municipality

Table 21 Brief Presentation of Measures Taken by Agios Athanasios 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 – Improving thermal behavior of the Town Hall	2012	14.550	10.200	5,6 years
ENEf 2 – Improving thermal behavior of the Youth Center	2012	2.040	1.088	7,7 years
ENEf 3 – Improving thermal behavior of the Municipal Library	2012	1.575	300	21 years
ENEf 4 – Improving thermal behavior of the Multifunction Center	2012	2.100	351	24 years
ENEf 5 -Energy saving in the Town Hall	2012	23.000	9.697	6,4 years
ENEf 6 – Renewable Electricity from Photovoltaic Systems on the Town Hall	2012	50.000	23.670	4,9 years
Energy Saving through Awareness Raising Campaigns				
ESAC 1 - Organization of an annual seminar on Renewable Energy Sources	2012-2014	3.000	213.030	-
ESAC 2 - Organization of an annual seminar on Energy Saving	2012-2014	3.000	101.917	-
ESAC 3 – Organization of an annual seminar on Energy Saving in Industries	2012, 2014, 2016	4.500	469.547	-
ESAC 4 - Organization of “Renewable Energy Sources (RES) and Energy Saving (ES)” Day	2010-2020	10.000	465.907	-
ESAC 5 - Organization of educational presentations to students	2010-2020	3.000	931.815	-
ESAC 6 - Organization of “Day without lighting”	2011-2020	1.500	116.477	-
ESAC 7 - Information about energy in the Municipality website and newspaper	2010-2020	0	291.192	-
ESAC 8 - Free consulting services to citizens from Municipal Officers	2012-2020	6.000	786.219	-
ESAC 9 - Organization of “Cycling	2010-2020	2.000	357.584	-

Day"				
ESAC 10 - Organization of "Eco-Cars Day"	2011-2013	1.000	69.793	-
ESAC 11- Raising awareness through informational leaflets and messages	2012-2020	12.000	968.975	-
Energy Saving in Transport				
EST1: Energy saving in transports by promoting eco-cars (hybrid and electric)	2010 -2014	17.500	405.675	-
EST2: Energy saving in the Municipality's fleet	2016-2020	30.000	6.653	-
Energy Saving in Street Lighting				
ESSL1: Energy saving in street lighting	2013	65.000	221	1.8 years
Investments of Agios Athanasios Municipality in RES				
RES1: Investments of the Municipality in renewable electricity	2013	365.000	187.782	5,1 years
Development of Green Spaces in Agios Athanasios Municipality				
DGS: Development of green spaces in the Municipality	2011-2020	11.000	90.000	-
Total		627.765	5.508.093	

7.9 Contribution of National Measures on the Sustainable Energy Action Plan of Agios Athanasios 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	Transport
1	Legislation on Energy Building Performance (Equation 1)	1.175	439	456	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	564	211	219	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	197	74	77	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	141	53	55	0
5	Legislation on energy efficiency of appliances (Equation 1)	837	405	474	0
6	Grant Schemes for the installation of Photovoltaic Systems (Equation 2)	450	375	750	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	105	46	55	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m ² (Equation 1)	0	439	182	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	1.039	0
10	Plan of single urban transport system (Equation 3)	0	0	0	14.924
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	9.895
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	1.583
13	Grant Schemes for hybrid vehicles and vehicles with low CO ₂ emissions (Equation 3)	0	0	0	950
14	Discounts on vehicles registration for vehicles with low CO ₂ emissions (Equation 3)	0	0	0	633
TOTAL PER SECTOR		3.469	2.041	3.305	27.986
GRAND TOTAL		36.801			

Table 23 Brief Presentation of CO₂ Emissions Reduction from National Measures

ΕΘΝΙΚΑ ΜΕΤΡΑ ΓΙΑ ΤΗΝ ΕΝΕΡΓΕΙΑ		Emissions Reduction (t CO ₂ /year)			
		Residential	Tertiary	Industry	Transport
1	Legislation on Energy Building Performance (Equation 1)	760	294	303	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	365	141	145	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	128	49	51	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	91	35	36	0
5	Legislation on energy efficiency of appliances (Equation 1)	541	271	315	0
6	Grant Schemes for the installation of Photovoltaic Systems (Equation 2)	291	251	498	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	68	31	37	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m ² (Equation 1)	0	294	121	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	690	0
10	Plan of single urban transport system (Equation 3)	0	0	0	3.770
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	2.500
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	400
13	Grant Schemes for hybrid vehicles and vehicles with low CO ₂ emissions (Equation 3)	0	0	0	240
14	Discounts on vehicles registration for vehicles with low CO ₂ emissions (Equation 3)	0	0	0	160
TOTAL PER SECTOR		2.245	1.367	2.196	7.069
GRAND TOTAL		12.877			

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

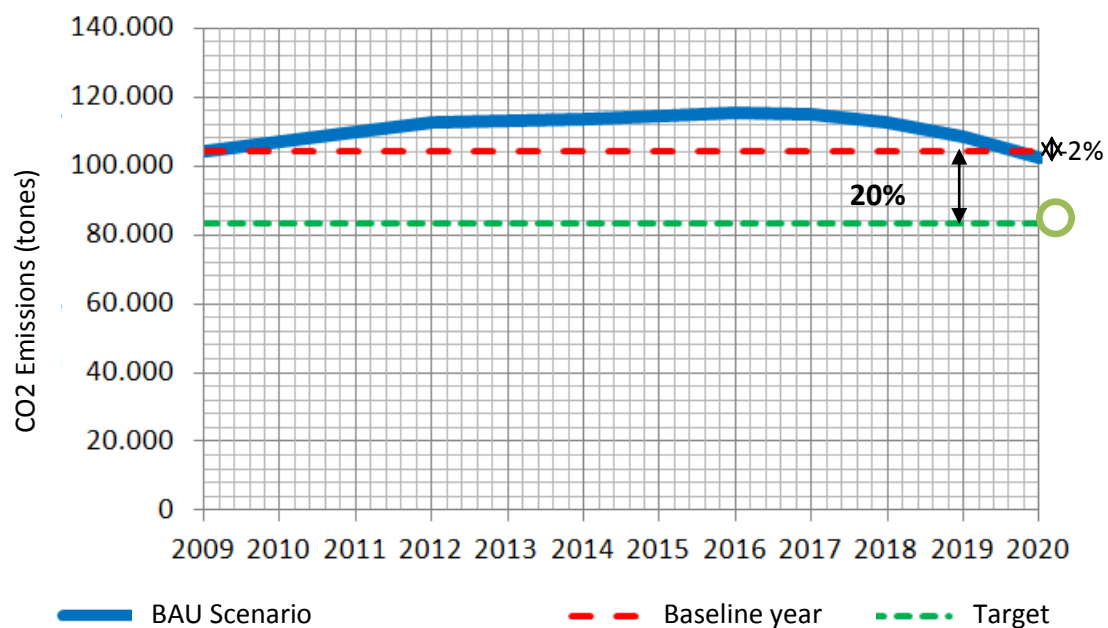
(1) $ES = EC * np * nc * ns$
ES: Energy Saving (MWh) EC: Energy Consumption (MWh) np: Number of Participation (0-100%) nc: Consumption rate per consumption category (0-100%) ns: Saving Percentage by applied measure (0-100%)
(2) $GE = N * P * np$
GE: Green Energy (MWh) N: Population P: Production per application (MWh) np: Participation percentage (rate) (0-100%)
(3) $EOS = (N * FO * np) + (\Delta O * FO * np)$
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% 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)	104.379
Expected emissions for 2020 – Expected Development Scenario (tn CO ₂ /year)	102.393
Estimated emission reduction from national measures for 2020 (tn CO ₂ /year)	12.877
Estimated emission reduction by the Municipality for 2020 (tn CO ₂ /year)	5.509
Total estimated emission reduction for 2020 (tn CO ₂ /year)	18.386
Estimated emissions for 2020 through the application of the Action Plan (tn CO ₂ /year)	84.007
Emission reduction percentage by 2020 compared with 2009	20%

Figure 27 Schematic of the Expected Evolution Scenario of CO₂ Emissions in Agios Athanasios Municipality and the Reduction Target for 2020 by 22%



Therefore by implementing the Sustainable Energy Action Plan, the Municipality of Agios Athanasios will reduce carbon dioxide emissions by **20%** compared to 2009 (reaching 84.007 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
- Incomes 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 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 Agios Athanasios 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 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 Larnaka from the Electricity Authority of Cyprus [www.eac.com.cy]
- ▶ Energy consumption data in municipal buildings in Larnaka
- ▶ 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:

Agios Athanasios Municipality

Mayor of Agios Athanasios Kyriakos Xaztitoffis

Coordinator: Antri Agathocleous

Contact Details:

Agios Athanasios Municipality

Stavraetou Machaira 42, pc. 4104,
Agios Athanasios, Cyprus
Tel. +357- 25864107
Fax: +357- 25729261
Email: mayor@agiosathanasios.org.vy
Web: www.agiosathanasios.org.cy

ISLEPACT Project :

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

Prepared by: Cyprus Energy Agency



Local Authority: Agios Athanasios Municipality



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