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PACT OF ISLANDS

Sustainable Energy Action Plan

ARADIPPOU MUNICIPALITY - CYPRUS

17 April 2011

Brief Summary

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

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

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

Aradippou Municipality is located in southern Cyprus, in a small distance from Larnaka International Airport and is the second largest town of Cyprus expanding over an area of an area of 42,982 square governmental acres.

The population of Aradippou rise up to 19.594 inhabitants according to the Census of 2011 whereas according to the previous Census of 2001 the population was 11.448 inhabitants.

The Sustainable Energy Action Plan was prepared by Cyprus Energy Agency.

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 Aradippou was 336.672 MWh. The largest consumer of energy in the municipality is transport with 179.279 MWh, followed by the tertiary sector with 62.805 MWh.

The CO_2 emissions in 2009 attributable to the overall energy consumption in the municipality are 146.093 tons.

For the forecast of CO_2 emissions in the period 2010 to 2020, the scenario of expected evolution was established, where it was estimated that without taking any measures emissions will amount to 151.744 tons.

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

The proposed measures are split into the following categories:

Description	**Number**
Energy Saving in Municipality public buildings	4
Energy Saving via informational campaigns	12
Energy saving in transport	4
Energy saving in street lighting	1
Municipality investments in renewable energy sources	2
Development of green spaces	1

The estimated annual emissions reduction for 2020 by applying the above measures amounts to 32.531tons. In addition, it was estimated that the impact on Aradippou Municipality from the implementation of the national measures taken to reduce carbon dioxide emissions will result to an additional decrease of 26.561 tons.

Therefore, with the implementation of the Sustainable Energy Action Plan and a total reduction of 106.754 tons, annual emissions for 2020 will be limited to 116.676 tons. That is **20.14 %** lower with respect to those in the reference year 2009.

The budget of the Action Plan for the period 2011 to 2020 amounts to **€861.025**. Funding for the implementation of the Energy Action Plan is expected to be taken from the following resources:

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

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1 THE ISLE-PACT PROJECT

1.1 Introduction

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

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

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

1.2 Commitments from signing the Covenant of Islands

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

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

1.3 Participating Municipalities and Communities in Cyprus

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

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

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

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 ARADIPPOU MUNICIPALITY

3.1 Introduction

Aradippou is situated in southern Cyprus, in a small distance from the International Airport of Larnaka. It was traditionally an agricultural village, but that changed since the Turkish invasion of 1974 and the building boom that followed. Today Aradippou is a hub for the national road network and the transportation hub of Rizoelia is known to every Cypriot. Aradippou was proclaimed a municipality in 1986 and has gradually established itself as a vigorous urban center. Once declared a municipality, Aradippou determined its municipal limits and is the second largest municipality in Cyprus, covering an area of 42,982 square governmental acres.

3.2 History

Aradippou takes its name after its settler King Aradippo. The excavations revealed architectural and other remains, dating from the era of the Achaeans. Aradippou was renowned in the Middle Ages because of a royal villa called "Avli tis Despotissas" (freely translated as Despotissas Garden) and belonged to the Lady Margaret de Lusignan, sister of Leo VI and granddaughter of Amory, Prince of Tyre.

3.3 Larnaka Local Plan

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

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

The Larnaka Local Plan was prepared in accordance with the relevant provisions of the Law on Town and Spatial Planning, was first published on the 1st December 1990 and was finalized after studying the appeals in two phases (1992 and 1994). The first amendment of the Local Plan was published on 4th October and the Plan was finalized after the study of appeals in two phases (1999 and 2000). During the study of that revision consultations were performed with the Joint Council of Larnaka which was established in accordance with the provisions of Article 12(1) of the Town and Country Planning Act.

Larnaka Local Plan specifies the general principles on which development in the area under the Local Plan will be promoted, monitored and regulated. It is expected that through the implementation of the Local Plan provisions a balanced development and town planning rationalization of the wider area of Larnaka will be reached gradually

The area under the Local Plan includes areas of Larnaka and Aradippou Municipalities, the areas of the Community Councils of Dromolaksia, Meneou and Livadia, the seafront of the

Community Councils of Voroklini and Pyla and a small area of the Community Council of Kalo Chorio as shown on Figure 10 (*Local Plan of Larnaka*).

The Local Plan extends over an area of 11547.4 hectares. According to the report of Statistics Census of Population (*Population Figures by District, Municipality and Community)* and an estimation for the areas of Voroklini and Pyla included in the Local Plan, the population amount up to of 70.049 people in 2001.

[Source: *Local Plan of Lanaka]*

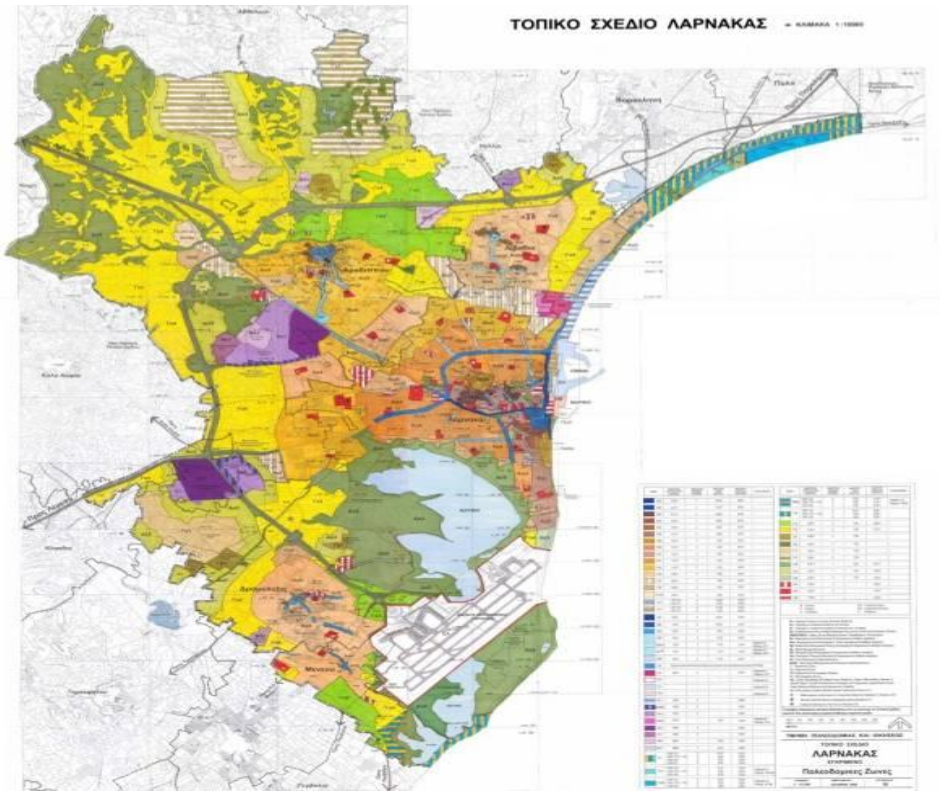


Figure 10 Local Plan of Larnaka

3.4 Structure Development in the Local Plan

The structure of the area under the Local Plan was influenced determinatively by several factors such as the seashore, the Saltlake, the Refinery and Oil Tanks, the Port, the Marina and the Airport. The structure of development in the Local Plan was greatly influenced by the timeless evolvement of the city and its outskirts without a town planning scheme and especially its evolution as “siamese”, consisting of the two distinctive modules of Scala and Larnaka, the speculation in land, the turn of the touristic flows 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:

(a) 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.

(b) 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. These tendencies resulted among other to the interference of incompatible land uses and the traffic burden of some roads beyond their objective limitations.

(c) 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.

(d) The linear touristic development lengthwise the seafront.

(e) The construction of the Port and the International Airport.

(f) The construction of Governmental Housing Settlements and Self–Help Housing of Refugees in the city outskirts and the precinct.

[Source: *Local Plan of Larnaka]*

Figure 11 Kaimakliotis Museum

Figure 12 Archaeological site 'Panagia Aimatousa"

Figure 13 Saint Luke

Figure 14 Saint Fanourios

Figure 15 Saint Spyridon

Figure 16 Ais Stratigos

Figure 17 War Memorial

Figure 18 Mother's Monument

Figure 19 Aradippou Junior High School

Figure 20 Aradippou High School

Figure 21 Aerial Photo

Figure 22 Aerial Photo

Image 23 Aradippou Town Hall

Figure 24 Municipal Choir

[Source: www.aradipou.org.cy*]*

4 CURRENT STATUS AT ARADIPPOU MUNICIPALITY

4.1 Description of Aradippou Municipality Buildings

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. The main energy consumer regarding municipality buildings is the Town Hall.

4.2 Aradippou Municipality Street Lighting

According to the data provided by the Cyprus Energy Authority (CEA), the total energy consumption in 2009 for street lighting was equal to 2.436 MWh.

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

Table 1 Aradippou Municipality Lamp Types

LAMP TYPE	LAMP POWER	NUMBER
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 Aradippou Municipality.

4.3 Building Permits in Aradippou Municipality

The Table that follows presents data regarding the building permits in Aradippou Municipality in 2009 and 2010. These figures relate to the number, value and area of building permits issued and the number of dwelling units.

ISSUING AUTHORITY	2009			
	Number	**Area (m²)**	**Value (€000´s)**	**Dwelling Units**
Aradippou Municipality	270	100.434	82.119	366
ISSUING AUTHORITY	**2010**			
	Number	**Area (m²)**	**Value (€000´s)**	**Dwelling Units**
Aradippou Municipality	277	97.169	77.094	316

Table 2 Building Permits in Aradippou Municipality [Source: Cyprus Statistical Service]

4.4 Public Transport

Public transport within the limits of Aradippou Municipality is carried out by the local bus company "ZENON LTD". The company performs every route in the urban and district area of Larnaka. Except for the everyday routes, night routs and public holiday routes are also performed. The routes that include areas of Aradippou Municipality are presented in the following table:

Night route 444.	ARADIPPOU -VERGINA - KAMARES 2 - PORT – LARNAKA NIGHT ROUTES ON FRIDAY – SATURDAY ANND ON PUBLIC HOLIDAYS
Interior route 433	RIZOELIA AREA – ARADIPPOU – ARADIPPOU SQUARE
Interior route 434	NEW CEMETARY AREA – ARADIPPOU SQUARE
Route 435	ARADIPPOU - LARNAKA

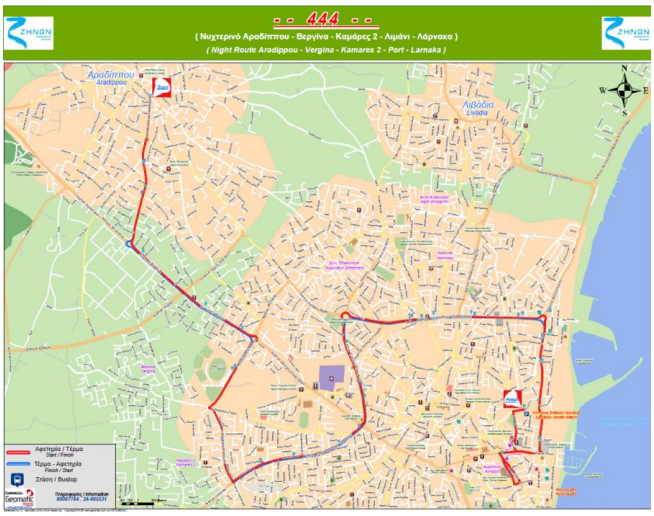


Figure 25 Schematic of night route 444 [Source: http://www.zinonasbuses.com]

4.5 Solid Waste Management and Recycling System in Aradippou Municipality

The collection of solid waste is carried out from Aradippou Municipality services and the disposal since April 2010 is performed in Koshi landfills.

The recycling system in Aradippou is performed by a contractor of the non profit organization Green Dot Cyprus, since 2009.

- The recycling system performed in Aradippou is "door to door", namely collection trucks of Green Dot pick up recyclables from outside every residence and premises.
- In Aradippou Municipality except for the "door to door" recycling system, recycling bins have also been placed for the collection of PMD (blue), paper (brown) and glass (green) and the collection is performed every week simultaneously with the "door to door" collection. The glass containers are picked when fully filled.

4.6 Aradippou Municipality Population

The population of Aradippou according to the Census of the Statistical Service of Cyprus of 2011 came up to 19.594 while according to the previous Census of 2001 the population came up to 11.448.

4.7 European and International Projects

Aradippou Municipality participates in the following European and International Projects, some of which are co-funded:

Covenant of Islands ISLE-PACT aims at developing Sustainable Energy Action Plans in Islands, in order to achieve the European objectives for a reduction of CO2 emissions by at least 20%	ISLE PACT SUSTAINABLE ENERGY ACTIONS FOR ISLANDS	www.islepact.eu

In addition to the above, Aradippou Municipality is going to finance the energy renovations of two houses in it's' limits, within the framework of the research project **ELIH-MED** (Energy Efficiency of Low Income Housing in the Mediterranean).

5 INVENTORY OF ENERGY CONSUMPTION IN ARADIPPOU MUNICIPALITY

5.1 Residential Sector

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

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot Water	1.096	959	68	4.451	34	240	**6.847**
Heating and Cooling	26.293	15.684	1.845	138	92	2.306	**46.359**
Lighting	1.461	-	-				**1.461**
Kitchen	1.096	-	470				**1.565**
Electrical Appliances	6.573	-	-				**6.573**
Total	36.518	16.642	2.383	4.589	126	2.546	**62.805**

5.2 Primary Sector

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

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Agriculture, Forestry, Fisheries	3.779	978	-	766	1.744	240	**7.275**
Mining and Quarrying	13	3	20	3	26	-	**39**
Total	**3.792**	**981**	**-**	**769**	**1.770**	**240**	**7.313**

5.3 Secondary Sector

Table 5 Energy Demand MWh in the Secondary Sector

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Processing	36.977	9.568	7.499	1.631	544	**56.220**
Water supply, wastewater treatment, waste management	41	11	8	-	-	**60**
Construction	357	92	72	-	-	**522**
Total	**37.375**	**1.075**	**7.580**	**1.631**	**544**	**56.802**

5.4 Tertiary Sector

Table 6 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	7.461	1.931	1.513	320	107	11.331
Hotels and Restaurants	522	135	106	22	7	793
Public Administration and Social Insurance	825	213	167	35	12	1.253
Defence, Justice, Police and Fire stations/departments	217	56	44	9	3	330
Education	642	166	130	28	9	975
Human Health and Social Care	372	96	75	16	5	565
Other Services	10.397	2.690	2.109	446	149	15.790
Public Lighting	2.436	-	-	-	-	2.436
Total	**22.872**	**5.288**	**4.145**	**876**	**292**	**33.473**

5.5 Transports

Table 7 Final Energy Consumption in MWh in Transports in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and Suburban Passenger Transports	-	1.829	1.696	-	**3.526**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	29.270	27.140	-	**56.409**
Commercial ground transportation services and removable services	-	-	-	-	**0**
Private Vehicles	-	60.369	55.975	-	**116.344**
Total	**29**	**91.468**	**84.811**	**-**	**176.279**

5.6 Total Final Energy Consumption in Aradippou Municipality

Table 8 Total Final Energy Consumption in MWh in Aradippou in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LPG	Solar	Wind	Geothermal	Biomass	Total
Residential	36.518	16.642	-	-	2.383	4.589	-	126	2.546	**62.805**
Primary	3.792	981	20	-	769	-	240	-	1.512	**7.313**
Secondary	37.375	9.671	-	-	7.580	1.631	-	-	544	**56.802**
Tertiary	22.872	5.288	-	-	4.145	876	-	-	292	**33.473**
Transports	-	-	91.468	84.811	-	-	-	-	-	**176.279**
Total	**100.557**	**32.583**	**103.148**	**84.811**	**14.877**	**7.096**	**240**	**126**	**4.893**	**336.671**

Figure 26 Share of Final Energy Consumption by Sector in 2009

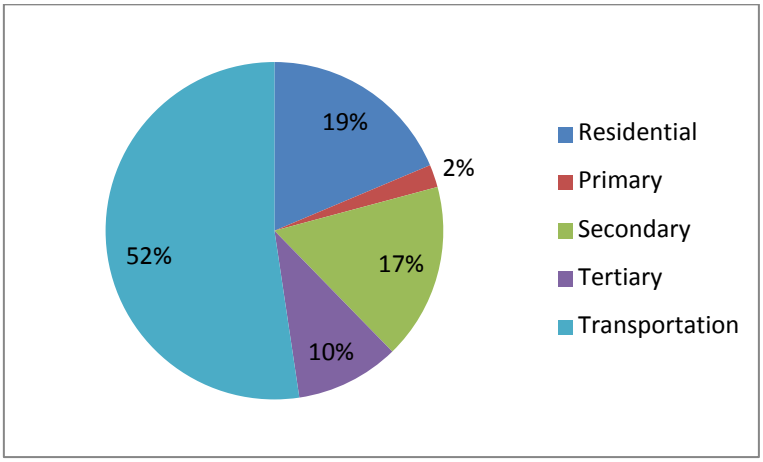
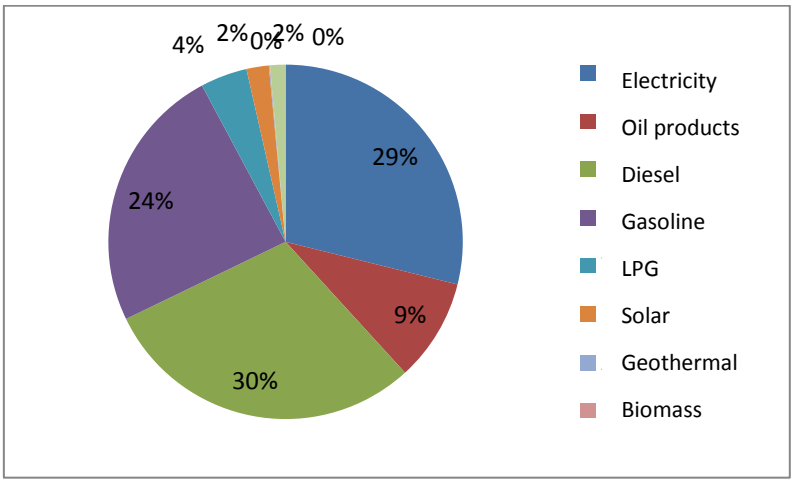


Figure 27 Share of Final Energy Consumption by Energy Source in 2009



6 INVENTORY OF CARBON DIOXIDE (CO_2) EMISSIONS IN ARADIPPOU 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 9 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 10 CO_2 Emissions in Tonnes in the Residential Sector of Aradippou in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Geothermal	Biomass	Total
Hot Water	958	267	16	-	-	-	1.241
Heating and Cooling	22.980	4.376	522	-	-	-	27.799
Lighting	1.277	-	-	-	-	-	1.277
Kitchen	958	-	133	-	-	-	1.070
Electrical Appliances	5.745	-	-	-	-	-	5.745
Total	**31.917**	**4.643**	**675**	**-**	**-**	**-**	**37.132**

6.3 Primary Sector

Table 11 CO_2Emissions in Tonnes in the Primary Sector of Aradippou in 2009

Description	Electricity	Fuel Oil	Diesel	LPG	Biomass	Total
Agriculture, Forestry, Fisheries	3.303	273	0	184	-	**3.760**
Mining and Quarrying	11	1	5	1	-	**18**
Total	**3.314**	**274**	**5**	**185**	**-**	**3.778**

6.4 Secondary Sector

Table 12 CO_2 Emissions in Tonnes in the Secondary Sector in Aradippou in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Processing	32.318	2.670	1.800	-	-	**36.787**
Water supply, wastewater treatment, waste management	36	3	2	-	-	**41**
Construction	312	26	17	-	-	**355**
Total	**32.666**	**2.698**	**1.819**	**-**	**-**	**37.183**

6.5 Tertiary Sector

Table 13 CO_2 Emissions in Tonnes in the Tertiary Sector of Aradippou Municipality in 2009

Description	Electricity	Fuel Oil	LPG	Solar	Biomass	Total
Wholesale and Retail trade, repair of motor vehicles and motorcycles	6.521	539	363	-	-	**7.423**
Hotels and Restaurants	456	38	25	-	-	**519**
Public Administration and Social Insurance	721	60	40	-	-	**821**
Defence, Justice, Police and Fire stations/departments	190	16	11	-	-	**216**
Education	561	46	31	-	-	**639**
Human Health and Social Care	325	27	18	-	-	**370**
Other Services	9.087	751	506	-	-	**10.344**
Public Lighting	2.129	-	-	-	-	**2.129**
Total	**19.990**	**1.475**	**995**	**-**	**-**	**22.460**

6.6 Transports

Table 14 CO_2 Emissions in Tonnes for Aradippou Municipality in 2009

Description	Electricity	Diesel	Gasoline	Biomass	Total
Urban and Suburban Passenger Transports	-	488	422	-	**911**
Other passenger transportation services (taxi, tourism, school buses, etc)	-	7.815	6.758	-	**14.573**
Commercial ground transportation services and removable services	-	-	-	-	**0**
Private Vehicles	-	16.118	13.938	-	**30.056**
Total	**-**	**24.422**	**21.118**	**-**	**45.540**

6.7 Total Final CO_2 Emissions in Aradippou Municipality

Table 15 Total CO_2 Emissions in Tonnes for Aradippou Municipality in 2009

Sector	Electricity	Fuel Oil	Diesel	Gasoline	LGP	Solar	Geothermal	Biomass	Total
Residential	31.917	4.643	-	-	572	-	-	-	**37.132**
Primary	3.314	274	5	-	185	-	-	-	**3.778**
Secondary	32.666	2.698	-	-	1.819	-	-	-	**37.183**
Tertiary	19.990	1.475	-	-	995	-	-	-	**22.460**
Transports	-	-	24.422	21.118	-	-	-	-	**45.540**
Total	**87.887**	**9.091**	**24.427**	**21.118**	**3.570**	-	-	-	**146.093**

Figure 28 Share of CO_2 Emissions by Sector in 2009

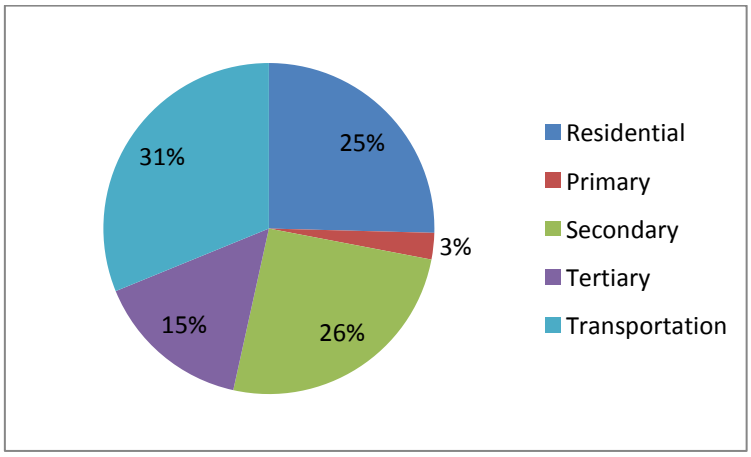
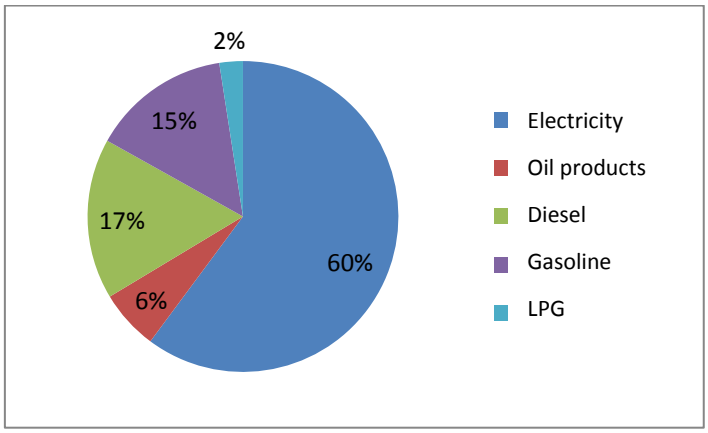


Figure 29 Share of CO_2 Emissions by Energy Source in 2009



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

Table 16 Growth Rates of Energy Consumption per Consumer Used in the Expected Evolution Scenario

Sector Description	Estimated annual energy consumption rate
Residential	
Hot water	3%
Heating and Cooling	3%
Lighting	3%
Cooking	3%
Refrigerators and freezers	3%
Washing and drying machines	3%
Dishwashers	3%
Televisions	3%
Other electrical appliances	3%
Primary Sector	
Agriculture, forestry and fisheries	2%
Mining and Quarrying	1,0%
Secondary Sector	
Processing	2%
Water supply, wastewater treatment, waste management and remediation activities	1%
Construction	1,5%
Tertiary Sector	
Wholesale and retail trade, repair of motor vehicles and motorcycles	3,5%
Accommodation services activities and food services	3%
Defense and justice services, police and fire stations/ departments	3%
General public administration and social insurance	2%
Education	3%
Activities related to human health and social care	2%

Sector Description	Estimated annual energy consumption rate
Other Services	3%
Municipal/ Public Lighting	3%
Transports (Vehicles)	
Private transports	2%
Urban and suburban passenger transports	2%
Other road transport services (taxi, tourism, school buses, etc.	0%
Freight road transports and removal services	4%
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	0%

Table 17 Increased Efficiency in Energy End – Use (Reducing the Final Energy for the same Useful Energy)

Sector Description	Estimated annual growth rate of end-use energy
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%
Transports (Vehicles)	
Private transports	0,5%

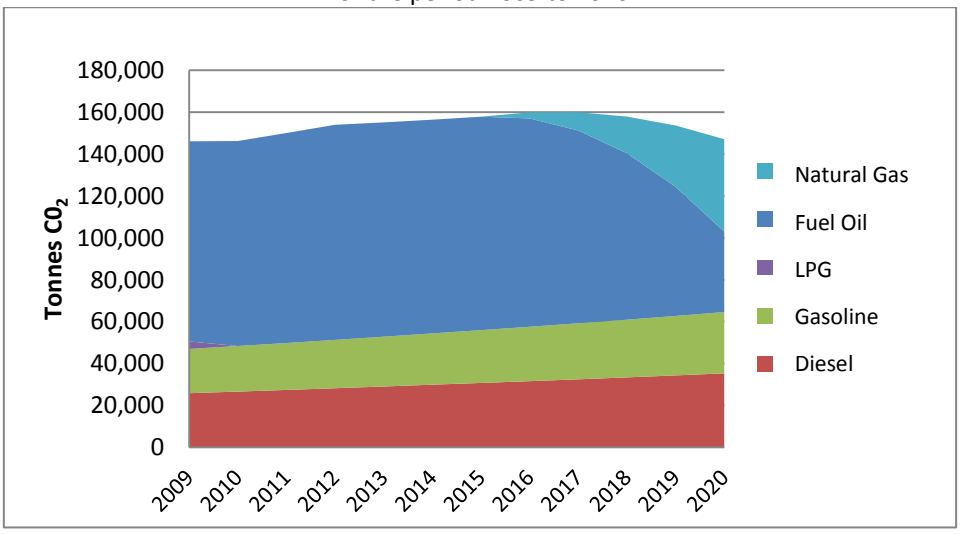
Table 18 Coefficients on Energy Performance for Electricity Generation

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

Table 19 Expected Evolution Scenario for Forecasting/ Projecting CO_2 Emissions for the period 2009 to 2020

Year	Fuel Oil	Diesel	Gasoline	LPG	Natural Gas	Total	Percentage increase based on 2009
2009	95.474	25.931	21.118	3.570	0	**146.093**	0%
2010	97.796	26.695	21.747	3.656	0	**149.893**	3%
2011	100.177	27.482	22.395	3.744	0	**153.798**	5%
2012	102.618	28.294	23.064	3.834	0	**157.809**	8%
2013	102.241	29.131	23.754	3.926	0	**159.051**	9%
2014	101.959	29.994	24.465	4.020	0	**160.439**	10%
2015	101.828	30.818	25.199	4.117	0	**161.962**	11%
2016	99.381	31.671	25.957	4.216	2.895	**164.121**	12%
2017	91.941	32.555	26.738	4.318	8.717	**164.269**	12%
2018	79.384	33.469	27.544	4.423	17.496	**162.316**	11%
2019	61.585	34.416	28.375	4.530	29.267	**158.172**	8%
2020	38.415	35.394	29.233	4.640	44.063	**151.744**	4%

Figure 30 Expected Evolution/ Projection Scenario for Forecasting CO2 Emissions for the period 2009 to 2020



7 SUSTAINABLE ENERGY ACTION PLAN OF ARADIPPOU MUNICIPALITY

7.1 Introduction

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

Emissions Reference Year 2009 (tn CO_2/year)	Expected annual emissions in 2020 (tn CO_2/year)	Minimum emissions target in 2020 (tn CO_2/year)	Desired minimum (20%) emissions reduction (tn CO_2/year)
146.093	151.744	116.874	34.870

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

ENERGY EFFICIENCY – Measure 1: Thermal Insulation

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

Measure implementation period: 2013 – 2016

Measure Code	**ENEF 1**		
Measure Name	**Insulation Interventions**		
APPLICATION COST			
Investment Cost	**Total Cost**		
Insulation Interventions	**16.000**		
Operation Cost			
Insulation Interventions	**0 €**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
	30.000		
Financial	Energy Saving (kWh/year)	Average electricity and fuel oil price (€/kWh)	**Saving (€/year)**
	30.000	0.18	**5.400**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
	21.270		
RESULTS - EVALUATION			
Estimated Unitary Cost (€/kg CO_2)	**1 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒	
MEASURE TO IMPLEMENT: ENEF1 Insulation Interventions			
Estimated Total Cost 16.000 €	**Saving 5.400 €**	**Emission Reduction 21.270 Kg_{CO2}/ year**	**Depreciation 3 years**

ENERGY EFFICIENCY – Measure 2: Energy Saving in the Town Hall

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

Measure implementation period: 2014

Measure Code	**ENEF 2**		
Measure Name	**Energy Saving in the Town Hall**		
APPLICATION COST			
Investment Cost	**Cost (€)**		
Voltage Rectifier Installation	**20.000**		
Lamp Replacement	**1.125**		
Operation Cost			
Voltage Rectifier Installation	**0 €**		
Lamp Replacement	**0 €**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
(a) Voltage Rectifier Installation	**9.000**		
(b) Lamp Replacement	**3.000**		
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	**Saving (€/year)**
(a) Voltage Rectifier Installation	9.000	0.25	**2.250**
(b) Lamp Replacement	3.000	0.25	**750**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
(a) Voltage Rectifier Installation	**7.866**		
(b) Lamp Replacement	**2.622**		
RESULTS – EVALUATION			
Estimated Unitary Cost (€/kg CO_2) ***(a)Voltage Rectifier Installation*** ***(b) Lamp Replacement***	 **2,85 €/ kg_{CO2} annual saving** **0,56 €/ kg_{CO2} annual saving**	**Proposed for Implementation** ☒ ☒	
MEASURE TO IMPLEMENT: ENEF 2 Energy Saving in the Town Hall			
Total Cost **21.125 €**	**Saving** **3.000 €**	**Emission Reduction** **10.488 Kg_{CO2}/ year**	**Depreciation** **7 years**

ENERGY EFFICIENCY – Measure 3: Maintenance of Air Conditioning Systems

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

Measure Implementation Period: 2012-2020

Measure Code	**ENEF 3**		
Measure Name	**Maintenance of Air Conditioning Systems**		
APPLICATION COST			
Investment Cost	**Cost (€)**		
Maintenance of air conditioning systems	**1.000**		
Operation Cost			
Maintenance of air conditioning systems	**1000 €/year**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	**Energy Saving (kWh/year)**		
	7.000		
Financial	Energy Saving (kWh/year)	Average electricity price (€/kWh)	**Saving (€/year)**
	7.000	0.25	**1.750**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
	4.963		
RESULTS - EVALUATION			
Estimated Unitary Cost (€/kg CO_2)	**0,16 €/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒	
MEASURE TO IMPLEMENT: ENEF3 Maintenance of Air Conditioning Systems			
Estimated Cost 1000 €	**Saving 1.750€**	**Emission Reduction 4.963Kg_{CO2}/ year**	**Depreciation 0,6 years**

ENERGY EFFICIENCY – Measure 4: Renewable Electricity from Photovoltaic Systems on Municipal Buildings

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

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

Measure Implementation Period: 2014

Measure Code	**ENEF 4**		
Measure NAME	**Renewable Electricity on Municipal Buildings**		
APLLICATION COST			
Investment Cost	**Total (€)**		
Photovoltaic System 20 kW	**50.000**		
Operation Cost			
Photovoltaic System 20 kW	**0 € (negligible cost for the periodical cleaning of the frames)**		
Indirect Cost			
	☐ **– High** ☒ **– Average** ☐ **– Low**		
APLICATION 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	0.28	**8.400**
Environmental	Emission Reduction Factor (kg_{CO2}/kW.year)	Power (kW)	**Emissions Saving (kg_{CO2}/ year)**
Photovoltaic System 20 kW	1.183	20	**23.660**
RESULTS – EVALUATION			
Unitary Cost (€/kg CO_2) ***Photovoltaic System 20 kW***	**2.1 €/ $kg_{CO2\ annual\ saving}$**		**Proposed for Implementation** ☒
MEASURE TO IMPLEMENT: ENEF 4 Renewable Electricity from Photovoltaic Systems on Municipal Buildings			

Total Cost	**Income**	**Emission Reduction**	**Depreciation**
50.000 €	**8.400 €**	**23.660 Kg_{CO2}/ year**	**6 years**

7.3 Energy Saving through Awareness Raising Campaigns

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 1: Organization of an annual seminar on Renewable Energy Sources

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

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

Measure Implementation Period: 2012-2014

Measure Code	**ESAC 1**	
Measure Name	**Organization of an annual seminar on Renewable Energy Sources**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APLICATION BENEFITS		
Energy Financial (Green energy €/year) Environmental (kg CO_2-eq)	**360.000 kWh/year** The financial benefits for interested parties **314.640 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.009€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*GEPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence GEPP: Green Energy per person (kWh)
Calculation: ES= 50*3*0,6*4*1000kWh/year= 360.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 2: Organization of annual seminar on Energy Saving

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

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

Measure Implementation Period: 2013-2015

Measure Code	**ESAC 2**	
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)	**157.500 kWh/year** The financial benefits for interested parties **111.668 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.027€/ $kg_{CO2\ annual\ saving}$**	**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: Energy Saving per person (kWh)
Calculation: ES= 100*3*0.25*3*700kWh/year= 157.500 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 3: 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 Aradippou Municipality was examined. The measure will apply for a period of 8 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 on 12 March 2012 (and every following year for 8 years)

Measure Code	**ESAC 3**	
Measure Name	**Organization of "Renewable Energy Sources (RES) and Energy Saving (ES)" Day**	
APPLICATION COST		
Cost of Measure	**10.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**960.000 kWh/year** The financial benefits for interested parties **680.640 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.02€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

Equation: ES=v*ε*n*vδ*ESPP
ES: Energy Saving (kWh) v: participation number ε: application years n: Awareness Percentage (0-100%) vδ: number of diffuse influence ESPP: Green Energy per person (kWh)
Calculation: ES= 200*8*0.25*4*600kWh/year= 960.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 4: Organization of educational presentations to students

The organization of educational presentations to students on renewable energy sources and energy saving was examined. The measure includes a set of fifteen (15) presentations.

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

Measure Implementation Period: 2010-2020

Measure Code	**ESAC 4**	
Measure Name	**Organization of educational presentations to students**	
APPLICATION COST		
Cost of Measure	**5.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy Saving. €/year) Environmental (kg CO_2-eq)	**1.620.000 kWh/year** The financial benefits for interested parties **1.148.580 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.005€/ $kg_{CO2\ annual\ saving}$**	**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= 150*15*0.4*3*600kWh/year= 1.620.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 5: Organization of "Day without lighting"

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

The indirect cost of the measure application can be considered as low.

Implementation on 30 March 2013 (and every following year for 7 years)

Measure Code	**ESAC 5**	
Measure Name	**Organization of "Day without lighting"**	
APPLICATION COST		
Cost of Measure	**1.400 €**	
Indirect Cost	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICAION BENEFITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**126.000 kWh/year** The financial benefits for interested parties **110.124 kg_{CO2}/year**	
RESULTS –EVALUATION		
Unitary Cost (€/kg CO_2)	**0.013€/ $kg_{CO2\ annual\ saving}$**	**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: Energy Saving per person (kWh)
Calculation: ES= 1500*7*0.05*3*80kWh/year= 126.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 6: 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 Aradippou website was examined. In addition, there will be a special article on energy in the Municipality quarterly newspaper. The measure will apply for a period of 10 years.

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

Start of Implementation: 2010 (and every following year for 10 years)

Measure Code	**ESAC 6**	
Measure Name	**Energy Information in the Municipality website and newspaper**	
APPLICATION COST		
Cost of Measure	**0 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APLICATION BENEFITS		
Energy Financial (Energy Saving. €/year) Environmental (kg CO_2-eq)	**450.000 kWh/year** The financial benefits for interested parties **319.050 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: Energy Saving per person (kWh)
Calculation: ES= 200*10*0.15*3*500kWh/year= 450.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 7: Free consulting services to citizens from Municipality Officers

The possibility of providing free consulting services to the citizens from a Municipal Officer 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.

Start of Implementation: 2013 (and every following year for 3 years)

Measure Code	**ESAC 7**	
Measure Name	**Free consulting services to the citizens from Municipal Officers**	
APPLICATION COST		
Cost of Measure	**10.000 €**	
Indirect Cost	☒ **– High** ☐ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**2.025.000 kWh/year** The financial benefits for interested parties **1.435.725 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.007 €/ $kg_{CO2\ annual\ saving}$**	**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: Energy Saving per person (kWh)
Calculation: ES= 100*3*0.75*5*1800kWh/year= 2.025.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - Measure 8 Organization of "Cycling Day"

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

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

Start of Implementation: September 2012 (and every following year for 10 years)

Measure Code	**ESAC 8**	
Measure Name	**Organization of Cycling Day**	
APPLICATION COSTT		
Cost of Measure	**4.000 €**	
Indirect Cost	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFIITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**2.400.000 kWh/year** The financial benefits for interested parties in terms of fuel saving **607.200 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.007€/ $kg_{CO2\ annual\ saving}$**	**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: Energy Saving per person (kWh)
Calculation: ES=100*10*0.4*3*2000kWh/year= 2.400.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - MEASURE 9: Organization of "Eco-cars Day"

The organization of "Eco-cars Day" in Aradippou Municipality was examined. The measure will be held annually for 7 consecutive years.

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

Start of Implementation: April 2013

Measure Code	**ESAC 9**	
Measure name	**Organization of Eco – Cars Day**	
APPLICATION COST		
Cost of Measure	**3500 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**448.000 kWh/year** he financial benefits for interested parties in terms of fuel saving **113.344 kg_{CO2}/year**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)	**0.031€/ $kg_{CO2\ annual\ saving}$**	**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: Energy Saving per person (kWh)
Calculation: ES= 80*7*0.1*8000kWh/year= 448.000 kWh/year

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - MEASURE 10: Raising awareness through informational leaflets and messages

The preparation of information material to be used for the updating, the 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: May 2010-2020

Measure Code	**ESAC 10**			
Measure Name	**Raising awareness though informational leaflets and messages**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
(a) Leaflets on RES and ES	**2.000 €**			
(b) Leaflets on sustainable mobility	**2.000 €**			
(c)Articles in the Municipality's Newspaper	**0 €**			
(d) TV Spots	**5000 €**			
(e) Radio Spots	**3000 €**			
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	10.000	5%	2210	**1.105.000**
(b) Leaflets on sustainable mobility	10.000	5%	2210	**1.105.000**
(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 Saving (kg_{CO2}/ year)**			
(a) Leaflets on RES and ES	783.445			
(b) Leaflets on sustainable mobility	279.565			
(c)Articles in the Municipality's Newspaper	155.980			
(d) TV Spots	124.784			
(e) Radio Spots	85.080			

RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
(a) Leaflets on RES and ES	**0.003 €/ $kg_{CO2\ annual\ saving}$**	☒
(b) Leaflets on sustainable mobility	**0.007 €/ $kg_{CO2\ annual\ saving}$**	☒
(c)Articles in the Municipality's Newspaper	**0 €/ $kg_{CO2\ annual\ saving}$**	☒
(d) TV Spots	**0.04 €/ $kg_{CO2\ annual\ saving}$**	☒
(e) Radio Spots	**0.035 €/ $kg_{CO2\ annual\ saving}$**	☒
MEASURE TO IMPLEMENT: ESAC 10 Raising awareness though informational leaflets and messages		
Total Cost **12.000 €**		**Emissions Reduction** **1.428.854 Kg_{CO2}/ year**

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - MEASURE 11: Organization of annual seminar on "Energy Saving in Industry"

The organization of an annual seminar on "Energy Saving in Industry" in Aradippou Municipality was examined. The all-day seminar will be held in the Town Hall for 3 consecutive years.

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

Measure Implementation Period:2013-2015

Measure Code	**EKEN11**	
Ονομασία μέτρου	**Organization of annual seminar on "Energy Saving in Industry"**	
APPLICATION COST		
Cost of Measure	**3.000 €**	
Indirect Cost	☐ **– High** ☒ **– Average** ☐ **– Low**	
APPLICATION BENEFITS		
Energy Financial (Energy Saving €/year) Environmental (kg CO_2-eq)	**157.500 kWh/year** The financial benefits for interested parties **101.917 kg_{CO2}/year**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)	**0.003€/ $kg_{CO2\ annual\ saving}$**	**Proposed for Implementation** ☒

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

ENERGY SAVING THROUGH AWARENESS RAISING CAMPAIGNS - MEASURE 11: Free distribution of energy saving equipment in Aradippou Municipality households

The distribution of free energy saving equipment (stand by killers) to the citizens was examined. The equipment will contribute to saving energy that is consumed by electrical appliances that remain on standby mode.

The indirect cost o measure can be considered lo as the citizens will be given the equipment (one per household) for free from the Municipality and as long as they succeed to apply the measure they can obtain extra equipment themselves. The municipality can provide the citizens with the stand-by killers according to certain criteria such as:

A) Financial Criteria
B) Municipal contest
C) Distinction from participating in a Municipal contest

Implementation Period: 2014

Measure Code	**ESAC 12**		
Measure Name	**Free distribution of energy saving equipment in Aradippou Municipality households**		
APPLICATION COST			
Cost of Measure	**Total (€)**		
(a) Distribution of 500 stand-by killers	**20.000 €**		
Indirect Cost			
	☐ **– High** ☐ **– Average** ☒ **– Low**		
APPLICATION BENEFITS			
Energy	Number / Recipients	Energy Benefit (kWh/person.year)	**Energy Saving (kWh/year)**
(a) Distribution of 500 stand-by killers	1000	585	**585.000**
Financial			
	The financial benefits for interested parties in terms of energy saving		
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
(a) Distribution of 500 stand-by killers	511.290		
RESULTS - EVALUATION			
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**	
(a) Distribution of 500 stand-by killers	**0.039 €/ kg_{CO2} annual saving**	☒	
MEASURE TO IMPLEMENT: ESAC 12 Free distribution of energy saving equipment in Aradippou Municipality households			
Total Cost **20.000 €**		**Emissions Reduction** **511.290 Kg_{CO2}/ year**	

7.4 Energy Saving in Transport

ENERGY SAVING IN TRANSPORT – MEASURE 1: Energy saving in transports by promoting eco-cars (hybrid and electric)

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

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

Measure Implementation Period: June 2011 – 2015

Measure Code	**EST1**			
Measure Name	**Promotion of vehicles with low CO_2 emissions**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
(a) Free Parking Spaces (10 spaces)	**15.000 € *loss of income**			
(b) Charging points for electric vehicles (4 points)	**2.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	Number of spaces	Traffic (5 years)	ES per visit + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
(a) Free Parking Spaces (10 spaces)	10	14.600	70	**1.022.000**
(b) Charging points for electric vehicles (4 points)	4	1825	80	**584.000**
Financial				
	The financial benefits for interested parties in terms of energy saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
(a) Free Parking Spaces (10 spaces)	**258.566**			
(b) Charging points for electric vehicles (4 points)	**147.752**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for implementation**	
(a) Free Parking Spaces (10 spaces)	**0.058 €/ $kg_{CO2\ annual\ saving}$**		☒	
(b) Charging points for electric vehicles (4 points)	**0.013 €/ $kg_{CO2\ annual\ saving}$**		☒	
MEASURE TO IMPLEMENT: EST 1 Promotion of vehicles with low CO2 emissions				
Total Cost **17.000 €**		**Emissions Reduction** **405.318Kg_{CO2}/ year**		

ENERGY SAVING IN TRANSPORT – MEASURE 2: 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 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 – 2018 – 2020

Measure Code	**EST 2**	
Measure Name	**Energy saving in the Municipality's Fleet**	
APPLICATION COST		
Cost of Measure	**Total (€)**	
Purchase of 3 eco cars	**45.000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Energy	**Energy Saving (kWh/year)**	
Purchase of 3 eco cars	**27.630**	
Financial	**Saving (€/year)**	
Purchase of 3 eco cars	**3.000**	
Environmental	**Emissions Saving (kg_{CO2}/ year)**	
Purchase of 3 eco cars	**6.980**	
RESULTS - EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
Purchase of 3 eco cars	**6.45 €/ $kg_{CO2\ annual\ saving}$**	☒
MEASURE TO IMPLEMENT: EST 2 Energy saving in the Municipality's Fleet		
Total Cost **45.000 €**		**Emissions Reduction** **6.980 Kg_{CO2}/ year**

ENERGY SAVING IN TRANSPORT – MEASURE 3: Energy saving in transports by promoting the use of bicycles (Bicycle Rental System)

The possibility of promoting bicycle use by installing a bicycle rental system was examined. The bicycle rental system will operate in collaboration with Municipalities of Larnaka District or other private (touristic) companies. The measure will be implemented for 6 years, starting in 2014.

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

Start of Implementation: 2014 (for 6 years)

Measure Code	**EST 3**			
Measure Name	**Bicycle Rental System**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
2 spaces και 15 bicycles	**30.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	Number of Bicycles	Traffic per year	ES per bicycle + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
2 spaces και 15 bicycles	15	1095	40	**657.000**
Financial				
	The financial benefits for interested parties in terms of fuel saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
2 spaces και 15 bicycles	**165.958**			
RESULTS - EVALUATION				
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**	
2 spaces και 15 bicycles	**0.18 €/ $kg_{CO2\ annual\ saving}$**		☒	
MEASURE TO IMPLEMENT: EST 3 Bicycle Rental System				
Total Cost 30.000 €			**Emissions Reduction 165.958 Kg_{CO2}/ year**	

ENERGY SAVING IN TRANSPORT – MEASURE 4: Energy Saving in Transport by Upgrading the Cycle Path Network in Aradippou

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

The indirect application costs is considered low.

Start of Implementation: 2014 (for 6 years)

Measure Code	**EST 4**			
Measure Name	**Upgrade of Cycle Path Network**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
Upgrade of Cycle Path Network	**100.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	New Cycle Paths (km)	Traffic per Year (Number of routes)	ES per Km + ES from diffuse information (kWh/ year)	**Energy Saving (kWh/year)**
Upgrade of Cycle Path Network	10	10.000	20	**2.000.000**
Financial				
	The financial benefits for interested parties in terms of fuel saving			
Environmental	**Emissions Saving (kg_{CO2}/ year)**			
Upgrade of Cycle Path Network	**472.000**			
RESULTS – EVALUATION				
Unitary Cost (€/kg CO_2)				**Proposed for Implementation**
Upgrade of Cycle Path Network	**0.21 €/ $kg_{CO2\ annual\ saving}$**			☒
MEASURE TO IMPLEMENT: EST 4 Upgrade of Cycle Path Network				
Total Cost **100.000 €**			**Emissions Reduction** **472.000 Kg_{CO2}/ year**	

7.5 Energy Saving in Street Lighting

ENERGY SAVING IN STREET LIGHTING – MEASURE 1: 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 Aradippou Municipality in 2009 was 1.977 MWh.

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

The indirect application cost can be considered low.

Year of Measure Implementation: 2013

Measure Code	**ESSL 1**			
Measure Name	**Energy Saving in Street Lighting**			
APPLICATION COST				
Cost of Measure	**Total (€)**			
(a) Replacement of current lamps with economic LED lamps	**100.000 €**			
(b) Optimization of Street Lighting operation hours	**5.000 €**			
Indirect Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
Maintenance Cost				
	☐ **– High** ☐ **– Average** ☒ **– Low**			
APPLICATION BENEFITS				
Energy	Number	Electricity consumption per lamp (kWh/year)	ES per lamp per year (%)	**Energy Saving (kWh/year)**
(a) Replacement of current lamps with economic LED lamps	400	800	60	**192.000**
(b) Optimization of Street Lighting operation hours	800	800	5	**32.000**
Financial	Energy Saving (kWh/year)	Average Electricity Price (€/kWh)	**Saving (€/year)**	
(a) Replacement of current lamps with economic LED lamps	192.000	0.25	**48.000**	
(b) Optimization of Street Lighting operation hours	32.000	0.25	**8.000**	
Environmental	**Emissions Saving (kg_{CO2}/ year)**			

(a) Replacement of current lamps with economic LED lamps	**167.808**		
(b) Optimization of Street Lighting operation hours	**27.968**		
RESULTS – EVALUATION			
Unitary Cost (€/kg CO_2)			**Proposed for Implementation**
(a) Replacement of current lamps with economic LED lamps	**0.48 €/ $kg_{CO2\ annual\ saving}$**		☒
(b) Optimization of Street Lighting operation hours	**0.179 €/ $kg_{CO2\ annual\ saving}$**		☒
MEASURE TO IMPLEMENT: ESSL 1			
Total Cost **105.000 €**	**Saving** **56.000 €**	**Emission Reduction** **195.776 Kg_{CO2}/ year**	**Depreciation** **1,875 years**

7.6 Investments of Aradippou Municipality in RES

INVESTMENTS IN RES – MEASURE 1: Investments of Aradippou Municipality in Renewable Electricity (solar)

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

Measure Implementation Period: 2014-2016

Measure Code	**RES 1**		
Measure Name	**Renewable Electricity with Photovoltaic System**		
APPLICATION COST			
Investment Cost	**Total (€)**		
Photovoltaic Park 150 kW	**350.000**		
Operational Cost			
Photovoltaic Park 150 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 Park 150 kW	150	1500	**225.000**
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	**Income (€/year)**
Photovoltaic Park 150 kW	225.000	0.25	**56.250**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
Photovoltaic Park 150 kW	**196.650**		
RESULTS – EVALUATION			
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**	
Photovoltaic Park 150 kW	**2.535 €/ $kg_{CO2\ annual\ saving}$**	☒	
MEASURE TO IMPLEMENT RES 1 Renewable Electricity with Photovoltaic System			
Total Cost 350.000 €	**Income 56.250 €**	**Emissions Reduction 196.650 Kg_{CO2}/ year**	**Depreciation 6.2 years**

INVESTMENTS IN RES – MEASURE 2: Investments of Aradippou Municipality in Renewable Electricity (small wind turbines)

The installation of three small wind turbines of 30 kW total power 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.

Implementation Period: 2015

The small wind turbines will receive a subsidy of 55% of the cost from the 2009-2013 Grant Schemes of the Ministry of Commerce, Industry and Tourism.

Measure Code	**RES 2**		
Measure Name	**Investments of Aradippou Municipality in Renewable Electricity (small wind turbines)**		
APPLICATION COST			
Investment Cost	**Total (€)**		
3 small wind turbines 10 KW (no subsidy)	**40.000**		
Operational Cost			
3 small wind turbines 10 KW	**750 € per year for maintenance**		
Indirect Cost			
	☐ **– High** ☒ **– Average** ☐ **– Low**		
APPLICATION BENEFITS			
Energy	Power (kW)	Electricity Generation (kWh/kW.year)	**Green Energy (kWh/year)**
3 small wind turbines 10 KW	30	3.900	**39.000**
Financial	Green Energy (kWh/year)	Subsidized price of electricity (€/kWh)	**Income (€/year)**
3 small wind turbines 10 KW	39.000	0.18	**7.020**
Environmental	**Emissions Saving (kg_{CO2}/ year)**		
3 small wind turbines 10 KW	**30.771**		
RESULTS – EVALUATION			
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**	
3 small wind turbines 10 KW	**1.30 €/ $kg_{CO2\ annual\ saving}$**	☒	
MEASURE TO IMPLEMENT RES 1 Investments of Aradippou Municipality in Renewable Electricity (small wind turbines)			
Total Cost 40.000 €	**Income 7.020 €**	**Emissions Reduction 30.771 Kg_{CO2}/ year**	**Depreciation 6.3 years**

7.7 Development of Green Spaces in Aradippou Municipality

DEVELOPMENT OF GREEN SPACES IN ARADIPPOU MUNICIPALITY – Measure 1: Development of green spaces

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

The indirect application cost can be considered low.

Measure Code	**DGS 1**	
Measure Name	**Development of green spaces in Aradippou Municipality**	
APPLICATION COST		
Cost of Measure	**Total (€)**	
(a) Planting of trees (2000 trees)	**3000 €**	
(b) Care of Green Spaces	**8000 €**	
Indirect Cost		
	☐ **– High** ☐ **– Average** ☒ **– Low**	
APPLICATION BENEFITS		
Environmental	**Emissions Saving (kg_{CO2}/ year)**	
(a) Planting of trees (2000 trees)	**60.000**	
(b) Care of Green Spaces	**30.000**	
RESULTS – EVALUATION		
Unitary Cost (€/kg CO_2)		**Proposed for Implementation**
(a) Planting of trees (2000 trees)	**0.05 €/ $kg_{CO2\ annual\ saving}$**	☒
(b) Care of Green Spaces	**0.26 €/ $kg_{CO2\ annual\ saving}$**	☒
MEASURE TO IMPLEMENT DGS 1 Development of green spaces in Aradippou Municipality		
Total Cost **11.000 €**		**Emissions Reduction** **90.000 Kg_{CO2}/ year**

7.8 Summary of Measures of Aradippou Municipality

Table 20 Brief Presentation of Measures Taken by the Municipality of Aradippou and Included in the Sustainable Energy Action Plan

Measure/ Action	Application	Cost (€)	Emissions Reduction (Kg_{CO2}/ year)	Depreciation (years)
Energy Saving in Public Buildings				
ENEF1 – Insulation Interventions	2013-2016	16.000	21.270	3
ENEF2 – Voltage Rectifier Installation	2014	21.125	10.488	7
ENEF1 – Insulation Interventions	2012-2020	1.000	4.963	0,6
ENEF5: Renewable Electricity from Photovoltaic Systems on Municipal Buildings	2014	50.000	23.660	6
Energy Saving through Awareness Raising Campaigns				
ESAC1 – Organization of an annual seminar on Renewable Energy Sources	2012-2014	3.000	314.640	-
ESAC2 – Organization of an annual seminar on Energy Saving	2013-2015	3.000	111.668	-
ESAC3 – Organization of "Renewable Energy Sources (RES) and Energy Saving (ES)" Day	2012-2020	10.000	680.640	-
ESAC4 – Organization of educational presentations to students	2010-2020	5.000	1.148.580	-
ESAC5: Organization of "Day without lighting"	2013-2020	1.400	110.124	-
ESAC6: Information about energy in the Municipality website and newspaper	2010-2020	0	319.050	-
EKEN7: Free consulting services to citizens from Municipal Officers	2013-2026	10.000	1.435.725	-
ESAC8: Organization of "Cycling Day"	2012-2020	4.000	607.200	-
ESAC9: Organization of "Eco-Cars Day"	2013-2020	3.500	113.344	-

Measure/ Action	Application	Cost (€)	Emissions Reduction (Kg_{CO2}/ year)	Depreciation (years)
ESAC10: Raising awareness through informational leaflets and messages	2010-2020	12.000	1.428.854	-
ESAC11: Organization of an annual seminar on Energy Saving in Industries	2013-2015	3.000	101.917	-
ESAC12: Free distribution of energy saving equipment in Aradippou Municipality households	2014	20.000	511.290	-
Energy Saving in Transports				
EST1: Energy saving in transports by promoting eco-cars (hybrid and electric)	2011-2015	17.000	405.318	-
EST2: Energy saving in the Municipality's fleet	2016-2020	45.000	6.980	-
EST3: Energy saving in transports by promoting the use of bicycles (Bicycle Rental System)	2014-2020	30.000	165.958	-
EST4: Energy Saving in Transport by Upgrading the Cycle Path Network in Aradippou	2014-2020	100.000	472.000	-
Energy Saving in Street Lighting				
ESSL1: Energy saving in street lighting	2013	105.000	195.776	1,875
Investments of Aradippou Municipality in RES				
RES1: Investments of Aradippou Municipality in renewable electricity (solar)	2014-2016	350.000	196.650	6.2
RES2: Investments of Aradippou Municipality in renewable electricity (solar) (wind)	2015	40.000	30.771	6.3
Development of Green Spaces in Aradippou Municipality				
DGS: Development of green spaces in Aradippou Municipality	2012-2020	11.000	90.000	-
TOTAL		**861.025**	**8.506.866**	

7.9 Contribution of National Measures on the Sustainable Energy Action Plan of Aradippou 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 21 Brief Presentation of Energy Saving Measures from National Measures

NATIONAL MEASURES FOR ENERGY EFFICIENCY		Energy Saving (MWh/year)			
		Residential	Tertiary	Industry	Transports
1	Legislation on Energy Building Performance (Equation 1)	1.480	660	1.048	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	710	317	503	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	249	111	176	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	178	79	126	0
5	Legislation on energy efficiency of appliances (Equation 1)	1.054	610	1.090	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	1.043	869	1.738	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	132	70	127	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	660	419	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	2.390	0
10	Plan of single urban transport system (Equation 3)	0	0	0	29.782
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	19.596
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	4.703
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	2.508
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	3.135
	TOTAL PER SECTOR	4.844	3.377	7.619	59.725
	GRAND TOTAL	75.564			

Table 22 Brief Presentation of CO_2 Emission 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)	1.049	486	765	0
2	Legislation for the inspection of air conditioning and heating systems (Equation 1)	504	233	367	0
3	Grant Schemes for the installation of solar thermal systems (Equation 1)	176	82	128	0
4	Grant Schemes for the installation of geothermal systems (Equation 1)	126	58	92	0
5	Legislation on energy efficiency of appliances (Equation 1)	747	448	795	0
6	Grant Schemes for the installation of Photovoltaics Systems (Equation 2)	739	639	1.267	0
7	Legislation for mandatory integration of solar water heaters (Equation 1)	93	51	93	0
8	Legislation on energy efficiency of buildings with area larger than 1000 m^2 (Equation 1)	0	486	306	0
9	Grant Schemes for cogeneration in Industry (Equation 1)	0	0	1.743	0
10	Plan of single urban transport system (Equation 3)	0	0	0	7.523
11	Mandatory inspection of Vehicles MOT (Equation 3)	0	0	0	4.950
12	Withdrawal Plan of old vehicles (Equation 3)	0	0	0	1.188
13	Grant Schemes for hybrid vehicles and vehicles with low CO_2 emissions (Equation 3)	0	0	0	634
14	Discounts on vehicles registration for vehicles with low CO_2 emissions (Equation 3)	0	0	0	792
	TOTAL PER SECTOR	3.435	2.483	5.556	15.087
	GRAND TOTAL	26.561			

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

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

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

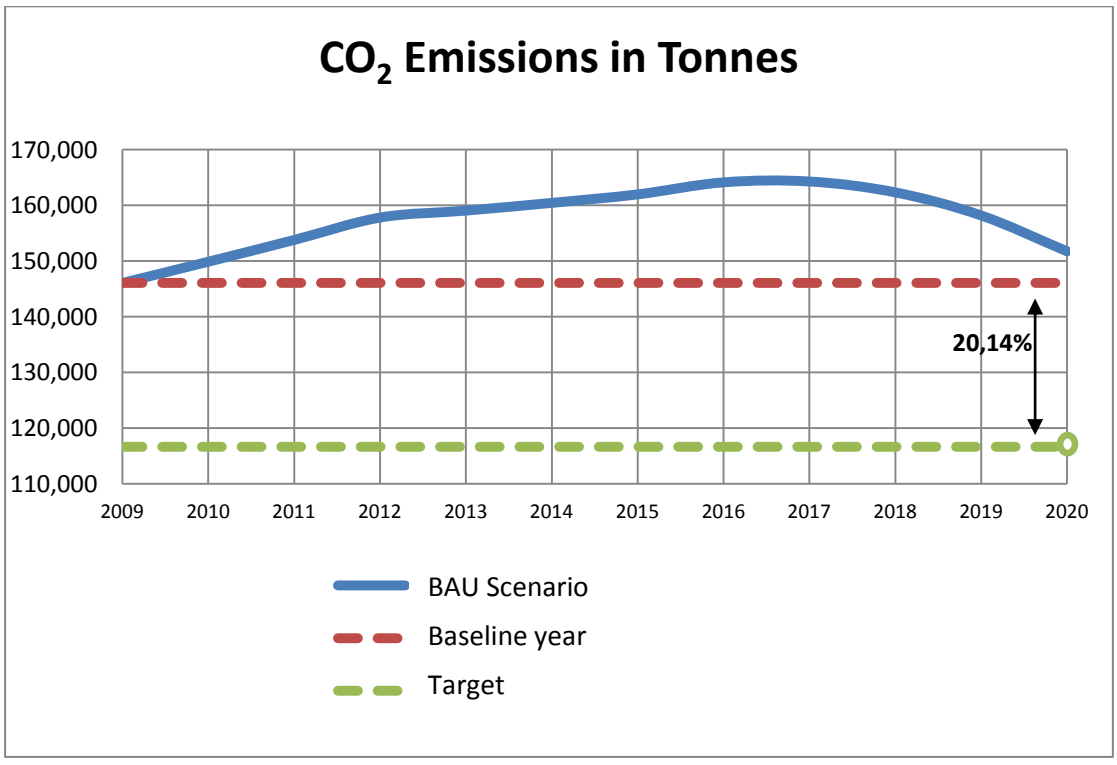
(3) EOS=(N*FO*np)+(ΔO*FO*np)
EOS: Energy Saving in terms of Fuel (MWh) N: Population FO: Fuel Saving per person (MWh) np: Participation percentage (rate) (0-100%) ΔO: Passing Vehicles

7.10 Description of Achieving CO_2 Emission Reduction by 2020

The achievement of reducing carbon dioxide emissions is presented in the table below.

Emission inventory for reference year 2009 (tn CO_2/year)	146.093
Expected emissions for 2020 – Expected Development Scenario (tn CO_2/year)	151.744
Estimated emission reduction from national measures for 2020 (tn CO_2/year)	26.561
Estimated emission reduction by the Municipality for 2020 (tn CO_2/year)	8.507
Total estimated emission reduction for 2020 (tn CO_2/year)	35.068
Estimated emissions for 2020 through the application of the Action Plan (tn CO_2/year)	116.676
Emission reduction percentage by 2020 compared with 2009	**20,14%**

Figure 31 Schematic of the Expected Evolution Scenario of CO_2 Emissions in Aradippou Municipality and the Reduction Target for 2020 by 20.14%



Therefore by implementing the Sustainable Energy Action Plan, the Municipality of Aradippou will reduce carbon dioxide emissions by **20.14%** compared to 2009 thus exceeding by 0.14% the overall objective of the project to reduce emissions by 20%.

Sources of energy data

- Consumption of fuels and heating fuels from oil companies within the administrative limits of Aradippou 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 Aradippou from the Electricity Authority of Cyprus [www.eac.com.cy]
- Energy consumption data in municipal buildings in Aradippou
- Information concerning the installation of more efficient electricity generators (combined cycle) from EAC [www.eac.com.cy]
- Information about the advent of Natural Gas from the Energy Service [http://www.mcit.gov.cy/mcit/mcit.nsf]

Note:

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

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