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PACT OF ISLANDS

ACTION PLAN FOR SUSTAINABLE ENERGY ISLAND

LA PALMA ISLAND (2012-2020)

April 2012

Executive summary

European islands with fragile ecosystems and weak local economies suffer an extra pressure of island ecosystems, transportation systems, energy systems and water needs due to the activities related to tourism. The island authorities have realized the need for joining the common efforts in the global strategy of fighting against climate change and European initiatives to reduce CO_2 emissions.

Under the European directive to achieve the objective of 20-20-20 in 2020, the "Isle PACT: Pact of Islands project" is an initiative of a consortium of European islands that have committed to reduce CO_2 emissions in order to meet EU objectives.

The Canary archipelago has a high economic vulnerability due to the almost exclusive dependence on fossil primary energy sources and its high exposure to volatility of oil market. Facing this reality, over the past two decades the Regional Government has developed the regional energy plans in order to define the actions that aim at sustainable development of the sector and ensure future energy supply.

Canary Islands have some unique peculiarities, reflected in various documents of agreement, both the state wide and European of Outermost Region. The singularities in the energy sector are also recognized. The remoteness of the continent and the fragmentation of the territory configurate the independent island power systems with small and weak grids that suppose an important technical restriction to maximization of Renewable Energy sources (RES) penetration, by its variable and intermittent nature. In addition, the land is a scarce property in the archipelago so to facilitate the implementation of renewable energy systems there is a need in territorial planning to makes the land use compatible with the development of these energies.

The current Action Plan for Sustainable Energy Island for the island of La Palma is a firm commitment to energy diversification that promotes the use of renewable energy and gives a fresh impulse to the efficient use of energy. The design of this Plan is done considering the protection of the environment as a complementary and necessary element to ensure sustainable development of the island.

There are four basic objectives which are set to achieve the following goals:

	Objectives	Targets
1.	**Ensure power supply**	Strategic stocks of hydrocarbons to ensure a minimum autonomy of 90 days
		Increased use of autochthonous sources to reduce dependence on foreign energy
2.	**Promote the rational use of energy**	Reduce by at least 25% the ratio between energy and GDP in relation to 2005
3.	**To encourage maximum use of renewable energy sources**	Use of autochthonous sources to increase up to 20% the participation of renewable energy resources in primary energy demand
4.	**Integrate the environmental dimension in all energy decisions**	Reduce by 30% of CO_2 emissions in comparison to 2005

Through this Plan of Action, the Island Local Government of El Hierro is aware of the economic, social and environmental importance of the energy and the need for political commitment of authorities to create conditions that accelerate the insular energy planning in a sense of preserving the fragile island ecosystems, contributing to energy independence, to supply security, to reduce the transfer abroad of income associated with oil import and to help achieve the objectives that EU assists in the adoption of measures to:

- Achieve and exceed in the Islands the goals set by the EU by 2020 by reducing CO_2 emissions in their respective territories by at least 20%, increasing energy efficiency by 20% and generating electricity with at least 20% of renewable energies.
- Ensure that energy market participants operate with maximum efficiency in generating, transmission and distribution.
- Promote Islands to become a platform for developing, testing and exports of new technologies and knowledge in the field of RES.
- Mobilize sustainable energy investments, creating public and private financing mechanisms that provide resources for investors to implement their most promising projects.
- Initiate a specific framework for promoting renewable energy sources to give them the opportunity to compete in a heavily subsidized market for conventional generating.
- Promote the development of regulatory/remuneration frameworks specific for energy storage systems that contribute to the stability of electrical networks in high-penetration settings of renewable energies.
- Support small-scale energy production, which is considered as a vital strategy for renewable energy penetration in island systems.
- Promote the associate consumption in the sector of water desalination as a way of increasing the RES penetration.

- Accelerate the introduction of electric vehicles as a means to promote the development of RES as a primary source in the transport sector.
- Make profitable the organic fraction of urban solid waste and sewage sludge, to turn existing problems in this area into an energetic opportunity that contributes to sustainable development of the Islands.
- Promote the restructuring of existing conventional generating plant replacing it by more flexible and efficient groups that meet the priority introduction of renewable energies in the Islands.
- To raise the level of public awareness about the efforts of the islands in the fight against climate change.
- Support small and medium enterprises sector of renewable energies as a sector that contribute to the diversification of the economy, and move towards a productive model that generates quality employment and wealth.

These are processes of change that require extensive involvement and social requirements in addition to acquiring both the administration and the energy companies, without whose commitment to its success would be indeterminate.

The total budget for the implementation of this plan reaches the amount of €473,902,312, obtained financing for the achievement of the proposed actions both regional and national resources and European programmes.

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1. CONTEXT

European islands with fragile ecosystems and weak local economies suffer an extra pressure of island ecosystems, transportation systems, energy systems and water needs due to the activities related to tourism. The island authorities have realized the need for joining the common efforts in the global strategy of fighting against climate change and European initiatives to reduce CO_2 emissions.

Under the European directive to achieve the objective of 20-20-20 in 2020, the "Isle PACT: Pact of Islands project" is an initiative of a consortium of European islands that have committed to reduce CO_2 emissions in order to meet EU objectives.

In Canary Islands, the Regional Government, being concerned about the high external dependency of petroleum products and energy vulnerability of the archipelago, has developed in the last two decades the energy plans in order to define actions aimed at sustainable development of the sector to ensure future energy supply.

The last Energy Plan developed in the Canaries is the PECAN 2006-2015. It provides an energy liberalization framework which is only subject to planning the infrastructure for generation and transmission of electricity and natural gas in a free market in the choice of supplier and negotiating prices and conditions. This Plan is a firm commitment to energy diversification promoting the use of renewable energy and giving a fresh impulse to the use of natural gas and efficient use of energy. The design of this Plan was made considering the protection of the environment as a complementary and necessary element to ensure sustainable development of the region.

On the other hand, the Canarian Agency for Sustainable Development and Climate Change, as a part of commitments made at global European and state levels to reduce emissions has developed the Canary Strategy to Fight Against Climate Change. Canaries are particularly obliged to consider a series of challenges to climate change, to be consistent with their greater wealth, greater vulnerability, responsibility, and their border situation. The reduction of emissions by reducing electricity consumption and use of private cars will be the work of a multitude of users that reduce their needs and consumption. Therefore, it deals with change processes that require extensive involvement and social demand. The emissions’ mitigation plan that constitutes the core of this Strategy puts the most emphasis on education and training, as essential elements for changing attitudes and social and individual habits. In the medium and long term, these will be the exclusive guarantors of success.

Thanks to the initiative of ISLE-PACT project, which proposes the development of specific plans for sustainable development in each of the islands, that make up the consortium preparing this Action Plan for the Sustainable Energy Development on the island of El Hierro in the time horizon until 2020. In drawing up this Plan of Action have been taken into account the various initiatives listed above as well as national plans developed in the energy sector, with emphasis on those that promote the use of renewable energy and rational use of energy. In this Plan, specific actions are defined in El Hierro in order to achieve the objectives, which are:

- To achieve an overall target of over 20% reduction in CO_2 emissions by 2020;
- Show the political commitment of the European islands to achieve the objectives of EU Sustainable Energy;
- To raise the level of awareness on the islands to help in the fight against climate change.

1.1. Geography and territory

1.1.1. Position and general characteristics

The Canary Islands can be roughly described geographically as African, biogeographically as Macaronesian and subtropical and culturally as European, particularly Mediterranean, basing their economic development on a privileged geostrategic position and mid-Atlantic climate.

The archipelago is situated in the central-eastern margin of the Atlantic Ocean, being part of the Macaronesian Region. The Canary Islands consist of two groups of islands, which correspond to two canary provinces, called for their situation, East and West.

- The group of eastern islands forms the province of Las Palmas. Formed by the islands of Lanzarote and its five island territories (Roque del Este, Alegranza, Roque del Oeste, Montaña Clara and Graciosa), the island of Fuerteventura and its island (Lobos) and the island of Gran Canaria. La Graciosa is the only island territory which is inhabited.
- Moreover, the province of Santa Cruz de Tenerife is composed by the Western group of islands: Tenerife, La Gomera, La Palma and El Hierro.

The two main islands, economically and administratively speaking, are Gran Canaria and Tenerife. They occupy the geographical centre, taking on one and other side their respective Eastern and Western groups. On those islands there are two provincial capitals, Las Palmas de Gran Canaria and Santa Cruz de Tenerife, respectively.

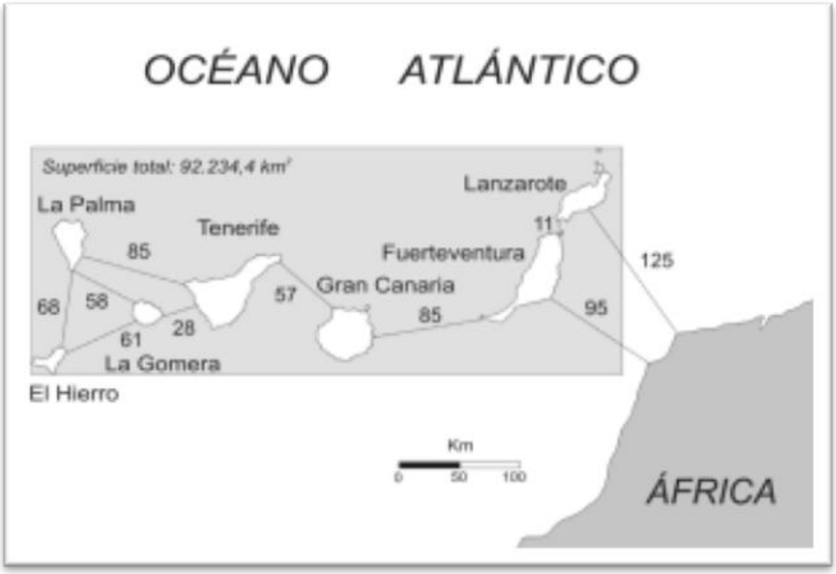


Figure 1 Distance between islands and Africa

Source: Islas Canarias, ¿una región aislada? (Canary Islands, aislated region?) Guillermo Morales Matos. University of LPGC/Carlos III of Madrid

Figure 2 Canary Islands

Source: Google Earth

The island of La Palma is located on the north-west of the Canary Islands, as shown in Illustration 1, it is also known as the “Beautiful island” or “Green island”, due to the exuberance of their forests. It is 85 km far from Tenerife and 1,440 km from the mainland (Cadiz). It is the only island of the Canary Islands that has streams or small rivers.

From an administrative standpoint, it is attached to the province of Santa Cruz de Tenerife and its capital is Santa Cruz de La Palma, being the most densely populated of the island Los Llanos de Aridane.

Since 2002, the entire island is a Biosphere Reserve, being after Lanzarote and El Hierro, the third of the canary islands which Unesco recognizes with that protection.

La Palma is composed of 14 municipalities distributed as shown in the following illustration:

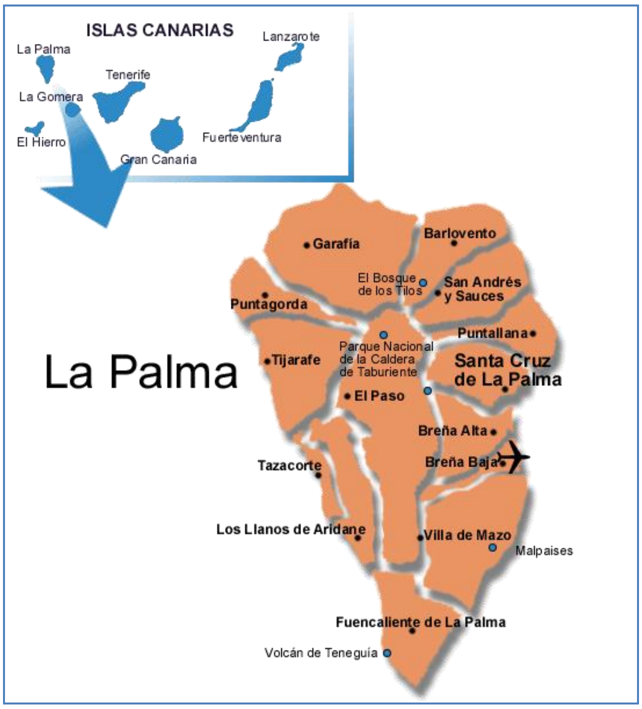


Figure 3 Municipalities of La Palma
Source: http://www.canary-travel.com/

The main features of the physical environment of each of the municipalities are presented in the following table:

	Area[1] (km^2)	Municipal perimeter (km)	Length of coastline (km)	Altitude[2] (m)	Distance[3] (km)
LA PALMA	**708.32**				

[1] Ground measurements of the townships include those of the islets and rocks:.
[2] The altitude is the capital city.
[3] The distance of each municipality refers to the capital island.

	Area[1] (km^2)	Municipal perimeter (km)	Length of coastline (km)	Altitude [2] (m)	Distance [3] (km)
Barlovento	43.55	39.88	14.1	548	39
Breña Alta	30.82	28.71	1.3	350	9
Breña Baja	14.2	30.74	7.28	300	7
Fuencaliente de La Palma	56.42	50.79	29.18	722	28
Garafía	103	58.8	25.5	400	87
Los Llanos de Aridane	35.79	42.66	6.43	325	32
El Paso	135.92	65.03	0	630	30
Puntagorda	31.1	35.56	8.8	600	50
Puntallana	35.1	37.56	12.95	420	12
San Andrés y Sauces	42.75	32.92	5.55	260	29
Santa Cruz de La Palma	43.38	30.88	4.03	15	103
Tazacorte	11.37	22.08	8.15	60	37
Tijarafe	53.76	36.58	12.95	640	51
Villa de Mazo	71.17	43.23	19.33	500	12

Table 1 General characteristics of the municipalities of La Palma
Source: ISTAC

1.1.2. Orography and Surface

The archipelago's total surface is 7,273 km^2, which represents 1.44% of total Spanish territory. The length of its coastline is 1,583 km. The highest point of the islands is the Teide peak situated at about 3,718 meters above sea level.

La Palma is located northwest of the archipelago. The island has an area of 708.32 km^2, representing a 9.51% of the canary territory and it has a population of 87,163 inhabitants (INE, January 2011), the fifth island in population.

Its territory is very steep, reaching 2,426 m at the Roque de los Muchachos, the highest point. In the northern area there is a large depression formed by the erosive origin which forms the Caldera, declared National Park in 1954. This submarine caldera, created by eruptions and erosion, which emerged to a height of 3,500 metres, is the largest crater in the world emerged. The interior of the boiler was drained in the geological past by a rapid emission of lava through a gap opened near the present Balcón de Taburiente where the Barranco de las Angustias is now located. Traces of this emission of lava can be seen inside the boiler, as these tracks (gullies on the inner walls) are oriented toward the centre of the crater and not outward, as it would have happened in a crater with explosive eruptions.

From the centre of the island to the south, in the so called Cumbre Vieja, there are a number of volcanoes, still active, among which are the San Antonio, the Volcano of San Juan and Teneguía, this being the latest volcanic eruption land of Spain in 1971. La Palma also has the Cumbre Vieja National Park and the Natural Park of Las Nieves, and a series of smaller protected entities and degree of protection.

In 1983, the area of "El Canal y Los Tilos" is declared as Biosphere Reserve by UNESCO. This area was expanded in 1997 to form the "Biosphere Reserve of Los Tilos". Finally, in 2002, the Reserve was extended to the whole island under the name Biosphere Reserve of La Palma.

Figure 4 Digital model of shades of La Palma
Source: GRAFCAN

1.1.3. Climate

The Canary Archipelago is situated between 28-29° latitude north of Ecuador and, therefore, near the Tropic of Cancer, should provide higher temperatures. However, thanks to the influence of trade winds the temperatures do not reach the values of the tropics. Due to their latitude position nearness Azores anticyclone, the islands are affected, during most of the year by the *trade winds*. These winds are originated as a result of the pressure difference between two areas; one of high pressure situated around 30° N, corresponding to the Azores anticyclone and another of an equatorial low pressure situated in the south of the archipelago.

The temperature and humidity differences between these two types of trades are what cause the so-called *thermal inversion*. This means that it is not always at higher altitudes colder or wetter. Another phenomenon that is caused by the effect of these two components of the trade winds is known as the *sea of clouds*: the lower trade winds are carrying moisture as they move to the south (passing over ocean area), while increasing their temperature. When the winds reach the north side of the islands, they begin their rise up the slopes condensing and increasing their relative humidity. The movement of upper dry and lighter winds stops the mentioned above rise from approximately 1,500 meters, causing more condensation that leads to the formation of the famous sea of clouds, very typical of the northern slope of the high islands. Depending on the increase of relative humidity and air velocity condensation or *horizontal precipitation* phenomena are frequent, which produce significant local rainfalls with that may exceed 300mm. per year. The influence of the trade winds on the Canary Islands is not the same throughout the year, as the Azores anticyclone shifts their position between winter and summer.

The Canary Islands are also influenced by other winds, not being constant have a local regularity. These are the Saharan winds, the polar seas' and the southern ones.

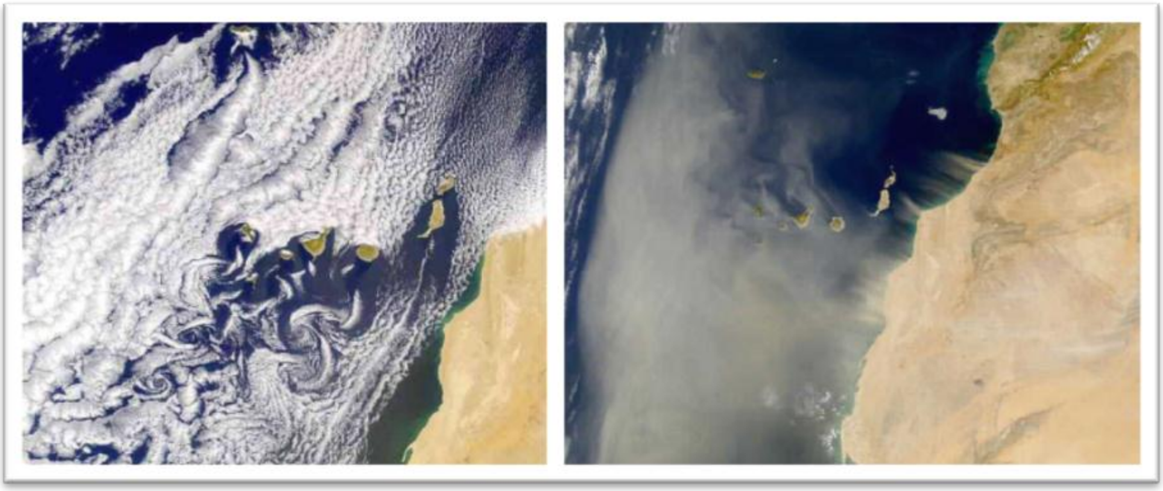


Figure 5 Influence of winds and Saharan winds, respectively, on the Canary Islands.

There are also other irregular air masses that form weather fronts. On rare occasions, those pass through the archipelago, produce very intense heavy showers benefiting from this water the islands of smaller height as well.

Due to its orography, La Palma enjoys a variety of climates depending on the month. In general, the climate is very mild below 500 meters, more continental up to 1,500 meters and rigorous to the Roque de los Muchachos (2,426 m) where winter frost and snowfall are frequent.

The trade winds mold and shape the landscape of the island as they enter with all their moisture in the east where they collide with the mountains producing horizontal rain which makes the green laurisilva grow. For this reason the east area has got a wet and cold weather and the west has drier weather where the vegetation completely changes with the appearance of the great pine forests.

On the slopes of El Paso it is common to observe the natural phenomenon called Foehn or Föhn effect. This phenomenon occurs in mountainous terrain when a mass of warm and moist air is forced to rise to save this obstacle. This causes that the water vapour cools and undergoes a process of condensation or reverse sublimation plunging into the windward slopes where orographic clouds and rain are formed.

1.2. Demography

2,126,769 inhabitants residing in the Canary Islands (updated data on 01/01/2011 INE), to which ones must be added more than 12 million of tourists who visit the islands each year, making this region the one of the most densely populated areas of the European Union.

The population is divided between the province of Las Palmas with 1,096,980 inhabitants which represents 51.58% of the regional total and the province of Santa Cruz de Tenerife with 1,029,789 inhabitants, 48.42%.

La Palma has an area of 708.32 km ² and a population of 87,163 inhabitants (INE, 2011).

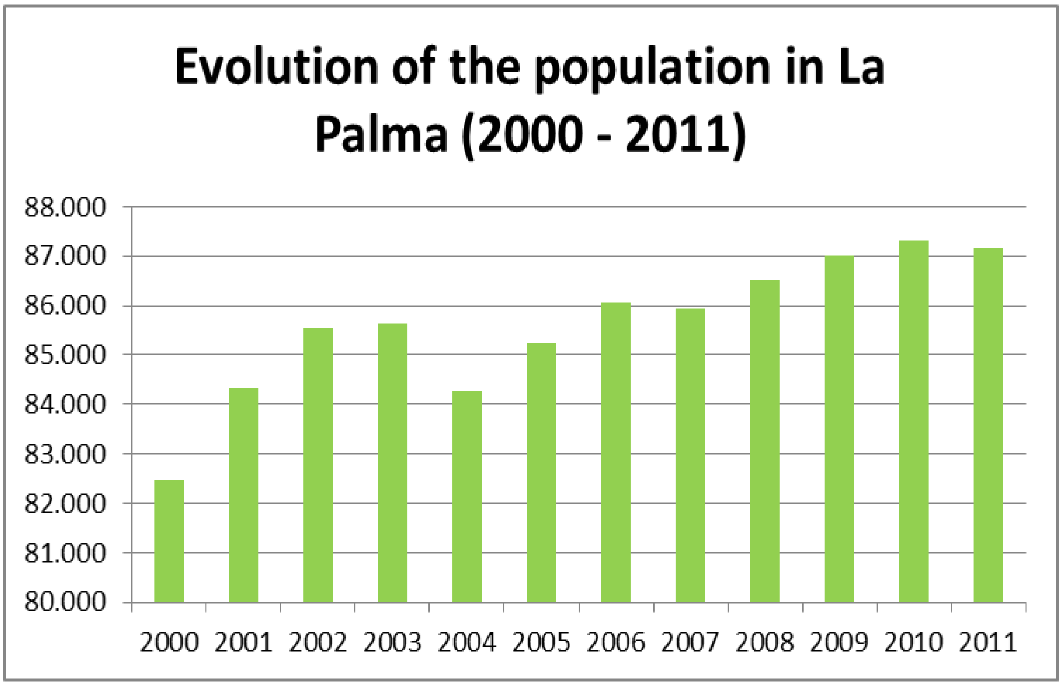
On the data source provided by the Canarian Institute of Statistics (LBS) and the National Statistics Institute (INE), the population of law in the island since January 1, 2003 until 1st January 2011, latest available data, is detailed in the following table.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Barlovento	2,367	2,350	2,507	2,506	2,383	2,387	2,363	2,296	2,231
Breña Alta	6,665	6,847	7,039	7,158	7,184	7,279	7,337	7,347	7,344
Breña Baja	4,187	4,186	4,355	4,470	4,708	4,952	5,115	5,259	5,348
Fuencaliente de La Palma	1,857	1,877	1,913	1,935	1,964	1,925	1,935	1,898	1,905
Garafía	1,998	1,948	1,924	1,886	1,849	1,829	1,804	1,714	1,707
Los Llanos de Aridane	20,001	19,659	19,878	20,173	20,170	20,525	20,766	20,948	21,145
El Paso	7,544	7,218	7,404	7,505	7,514	7,698	7,815	7,837	7,947
Puntagorda	1,789	1,708	1,795	1,962	1,974	1,955	2,108	2,177	2,028
Puntallana	2,364	2,380	2,424	2,368	2,407	2,423	2,460	2,425	2,416
San Andrés y Sauces	5,102	5,012	5,086	5,020	4,975	4,972	4,884	4,874	4,860
Santa Cruz de La Palma	18,201	17,857	17,788	17,640	17,353	17,132	17,084	17,128	16,924
Tazacorte	6,107	5,797	5,835	5,830	5,828	5,786	5,755	5,697	5,559
Tijarafe	2,687	2,666	2,713	2,720	2,744	2,757	2,768	2,769	2,763
Villa de Mazo	4,762	4,777	4,591	4,889	4,880	4,908	4,802	4,955	4,986
TOTAL	85,631	84,282	85,252	86,062	85,933	86,528	86,996	87,324	87,163

Table 2 De jure Population 2003 - 2011 of La Palma's municipalities
Source: INE. Data updated on 1st January 2011.

At present time, the most densely populated municipality of the island is Los Llanos de Aridane, surpassing in this respect to the island's capital Santa Cruz de La Palma, it is dedicated to the banana cultivation and tourism. The other major part is concentrated around the island's capital Santa Cruz de la Palma and the neighbouring municipalities of Breña Alta and Breña Baja. The north of the island, due to the orographic difficulties it has, is less populated.

Using historical data, the population has grown by 5.67% from 2000 to 2011.



Graph 1 Evolution of the population in La Palma 1998-2011

For the calculation, the hotel and extra hotel occupancy used is the average of 2011, latest available data, source ISTAC.

	Hotel Beds	Load factor	Total Hotel occupancy	Non-hotel Beds	Load factor	Total extra hotel occupancy	Total floating population
Barlovento	77	0.462	36	63	0.369	23	59
Breña Alta	23	0.462	11	100	0.369	37	48
Breña Baja	1,096	0.5327	584	2,626	0.369	969	1,553
Fuencaliente de	1,279	0.529	677	207	0.369	76	753

	Hotel Beds	Load factor	Total Hotel occupancy	Non-hotel Beds	Load factor	Total extra hotel occupancy	Total floating population
La Palma							
Garafía	12	0.462	6	156	0.369	58	63
Los Llanos de Aridane	840	0.462	388	1,859	0.369	686	1,074
El Paso	66	0.462	30	774	0.369	286	316
Puntagorda	8	0.462	4	65	0.369	24	28
Puntallana	0	0.462	0	97	0.369	36	36
San Andrés y Sauces	41	0.462	19	24	0.369	9	28
Santa Cruz de La Palma	379	0.2619	99	228	0.369	84	183
Tazacorte	0	0.462	0	462	0.369	170	170
Tijarafe	0	0.462	0	186	0.369	69	69
Villa de Mazo	10	0.462	5	240	0.369	89	93
TOTAL	**3,831**		**1,857**	**7,087**		**2,615**	**4,472**

Table 3 Hotel occupancy and other infrastructure half of 2011
Source: Department of the Presidency of Canary Island Government and ISTAC. Data updated on January 1, 2012.

Using data covering 1st January 2011 the actual population would be reflected in the following table:

Municipality	De jure population	Total floating population	De facto population
Barlovento	2,231	59	2,290
Breña Alta	7,344	48	7,392
Breña Baja	5,348	1,553	6,901
Fuencaliente de La Palma	1,905	753	2,658
Garafía	1,707	63	1,770
Los Llanos de Aridane	21,145	1,074	22,219
El Paso	7,947	316	8,263
Puntagorda	2,028	28	2,056
Puntallana	2,416	36	2,452
San Andrés y Sauces	4,860	28	4,888
Santa Cruz de La Palma	16,924	183	17,107
Tazacorte	5,559	170	5,729
Tijarafe	2,763	69	2,832
Villa de Mazo	4,986	93	5,079

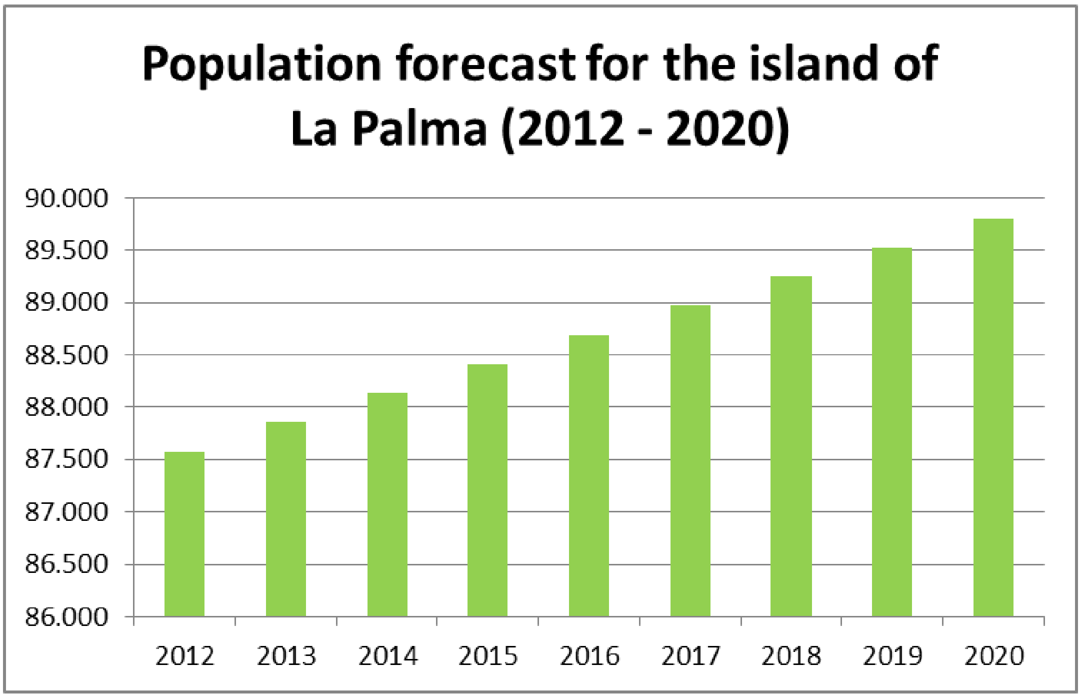
Municipality	De jure population	Total floating population	De facto population
Total	**87,163**	**4,472**	**91,635**

Table 4 Order of the municipalities according to population
Source: ISTAC

Building a simple regression line, using the method of least squares, we estimated de jure population until 2020, which is shown in the following table:

	2012	2013	2014	2015	2016	2017	2018	2019	2020
Barlovento	2,311	2,300	2,288	2,277	2,266	2,254	2,243	2,232	2,221
Breña Alta	7,685	7,804	7,923	8,042	8,161	8,280	8,399	8,518	8,637
Breña Baja	5,460	5,600	5,739	5,879	6,019	6,159	6,299	6,439	6,579
Fuencaliente de La Palma	1,963	1,975	1,987	1,999	2,011	2,023	2,035	2,047	2,059
Garafía	1,684	1,652	1,619	1,587	1,554	1,522	1,489	1,457	1,424
Los Llanos de Aridane	21,105	21,243	21,382	21,520	21,658	21,796	21,935	22,073	22,211
El Paso	7,921	7,980	8,038	8,096	8,155	8,213	8,272	8,330	8,388
Puntagorda	2,149	2,187	2,225	2,262	2,300	2,338	2,376	2,414	2,452
Puntallana	2,473	2,488	2,503	2,517	2,532	2,547	2,561	2,576	2,591
San Andrés y Sauces	4,792	4,753	4,715	4,676	4,637	4,598	4,559	4,521	4,482
Santa Cruz de La Palma	16,719	16,573	16,427	16,281	16,135	15,989	15,844	15,698	15,552
Tazacorte	5,555	5,505	5,454	5,404	5,354	5,304	5,254	5,203	5,153
Tijarafe	2,768	2,773	2,778	2,784	2,789	2,794	2,799	2,805	2,810
Villa de Mazo	4,995	5,026	5,057	5,088	5,119	5,150	5,182	5,213	5,244
TOTAL	**87,578**	**87,857**	**88,135**	**88,413**	**88,691**	**88,969**	**89,247**	**89,525**	**89,804**

Table 5 Estimated de jure population until 2020



Graph 2 Population forecast for the island of La Palma 2012-2020

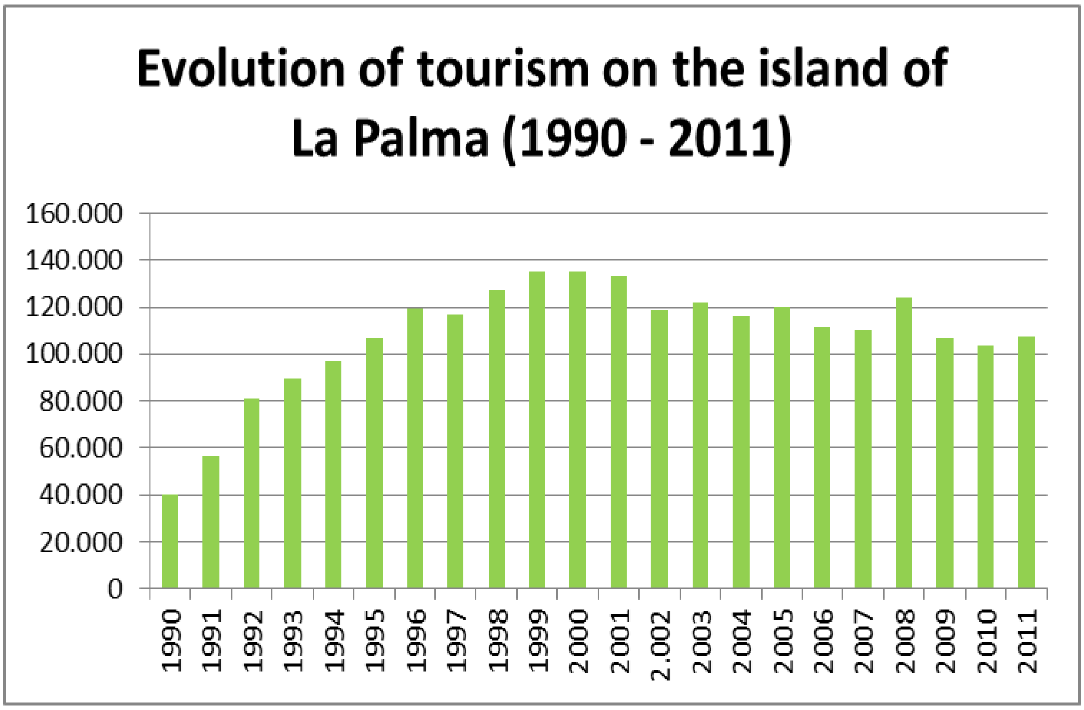
Forecasts of population evolution, for the island of La Palma conducted by the ISTAC are reflected in the table below.

:

	2012	2013	2014	2015	2016	2017	2018	2019	2020
La Palma	89,505	90,385	91,294	92,214	93,148	94,119	95,109	96,095	97,075

Table 6 Population forecast for the island La Palma 2012-2020
Source: ISTAC

Within the tourism sector, it is particularly important rural tourism in La Palma, away from mass tourism model adopted in other islands. As shown in the table, the data from the previous semesters show poor results.



Graph 3 Evolution of tourism on the island of La Palma 1990-2011

As shown in the chart, the evolution of the floating population on the island of La Palma is characterized by a steady growth over the last decade of the twentieth century until 2000. Later, and almost to this day, there was a gradual decline.

1.3. Economy

Traditionally, the economy on the Canary Islands was based on agriculture and trade, but since the sixties the utility industry has experienced tremendous growth due to tourism, which is now the most important economic activity. The industry remains in a second place, with the construction industry as its main engine followed by production of food and water, gas and electricity. Due to the specific characteristics of the Islands' economy (remoteness, land fragmentation, small market size ...), the size of the industrial sector is significantly lower than the national average.

The participation of different economic sectors reflects the absolute predominance of the service sector (75%), followed by construction (13.9%), industry (8.5%) and agriculture (2.6%). These data correspond to the situation at the end of 2006. The present economic situation has changed the landscape, being the construction sector the most negatively affected by this situation. In 2011, the percentage of stoppage unemployment reached 30% of the population.

One of the main structural problems of the Islands' economy is the archipelago's remoteness from the rest of the Spanish state and the other European Union countries. This has led to frame it in the same group of regions called "remote" with a broad legal recognition to the regulatory framework of the European Union. The disadvantages caused by the remoteness, to the Islands' economy, are heightened by the following factors:

a) Lack of raw materials.
b) Insularity or fragmentation of the territory on seven islands remoted one from each other.
c) Relief generally rugged.
d) A climate dominated by water scarcity.

This leads to the segmentation of their island economies and a considerable increase of production costs and distribution.

This fragmentation involves the rise in terms of costs and time of the inputs and outputs as well as the limited power of attraction to the locations of many productive activities.

Moreover, the small land area of the islands, with a high population density, makes that the pressure on natural resources, particularly land and water, is high, like natural ecosystems.

In addition, the Canary Islands have other characteristics which make them different from other existing economies in the rest of Spain and the continental European Union:

- Agriculture highly concentrated in a few export products mainly standing out the banana and tomato.
- Excessive dependence on the tourism sector that presents a high instability in the demand side.
- A trade balance showing a structural deficit.
- Economical growth based, in recent years, on the construction.

During the first decade of XXI century, Canary Islands underwent a process of unprecedented economic growth, which led it to improve, noticeably, its GDP per capita, at the same time increased the population itself. Much of this growth was due to aid from structural funds of the European Union and the creation of the Canary Islands Investment Reserve (RIC).

The current situation of the Islands' economy is a true reflection of the economic environment that exists both nationally and globally. Today, the Islands' economy has been plunged into a crisis that began to take shape with the deterioration of Spanish and European economies and their effects on the tourism product.

Around 24.32% of Canary tourism product is purchased by the Germans and about 34.72% by the British. For better or for worse about 60% of tourist flow depends largely on the progress of these two economies.

As shown in the table below, the gross domestic product at market prices has fallen from the levels reached in recent years, with a slight upturn in 2010.

	2008	2009	2010
GROSS DOMESTIC PRODUCT AT MARKET PRICES	**42,097,124**	**40,289,791**	**40,343,614**
Agriculture, ranching, forestry and fishing	466,033	468,958	459,129

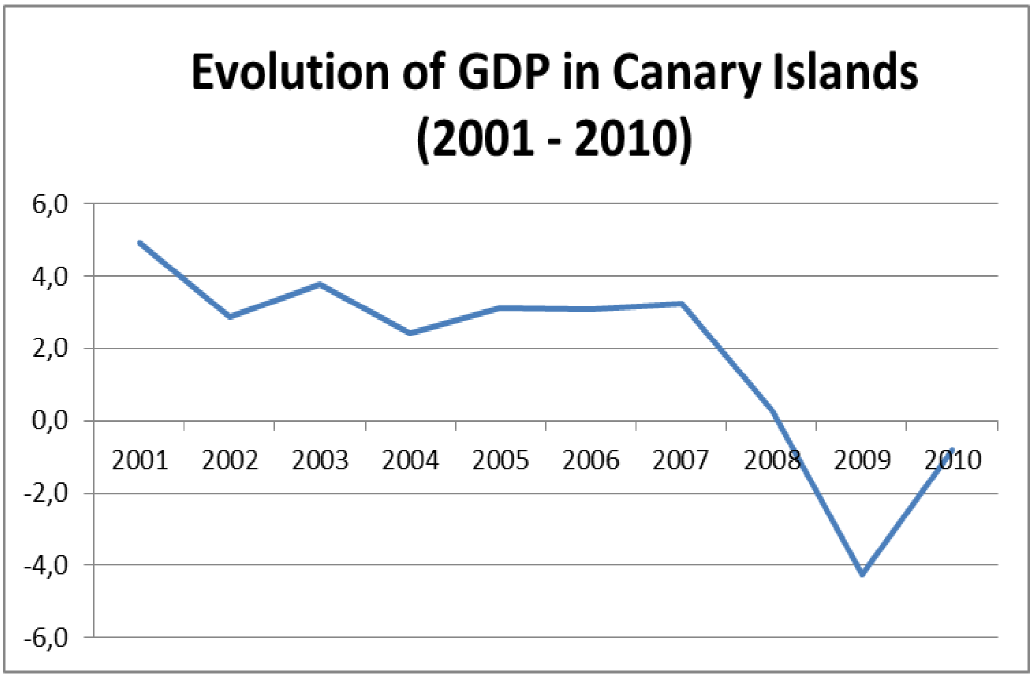
Mining and quarrying, manufacturing, supply of electricity, gas, steam and air conditioning, water supply, sewerage, waste management and decontamination. Of which:	3,156,369	2,984,800	2,986,855
Manufacturing	1,858,625	1,616,366	1,577,613
Construction	4,757,240	4,104,771	3,725,458
Wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage, catering	12,619,863	12,243,299	12,281,474
Information and communications	1,156,714	1,088,386	1,016,247
Financial and insurance	1,607,268	1,678,129	1,275,739
Real estate	3,527,425	3,198,777	3,669,918
Professional, scientific and technical, administrative and support service activities	2,516,910	2,542,818	2,537,006
Public administration and defence, compulsory social security, education, human health and social services	7,366,950	7,671,206	7,561,344
Arts, entertainment and recreation, repair of household goods and other services	1,409,875	1,436,306	1,386,427
Total gross value added	**38,584,647**	**37,417,450**	**36,899,597**
Net taxes on products	3,512,477	2,872,341	3,444,017
GROSS DOMESTIC PRODUCT AT MARKET PRICES	**42,097,124**	**40,289,791**	**40,343,614**

Table 7 Canary islands gross domestic product at market prices 2008-2010
Source: Regional accounts of Spain. INE

GDP had grown in the Canary Islands during the period between 2001 and 2007. Since 2008 the growth has been virtually nil or negative

	2001	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
GDP Canary islands	4.9	2.8	3.8	2.4	3.1	3.1	3.2	0.3	-4.2	-0.8

Table 8 Evolution of GDP in 2001-2010 in Canary islands
Source: Regional accounts of Spain. INE



Graph 4 Evolution of GDP in 2001-2010 in Canary Islands

For lack of data from the last quarter, the year 2011 will end with a negative GDP growth, but close to 0%, the graph which shows a slight recovery of the island's economy after spending the last two years with negative growth. According to the Regional Economics Department of Savings Banks Foundation (FUNCAS) in 2012 the growth is expected to be 0.0% in the Canaries.

It should be noted the participation of sectors in GDP, which indicates the weight of them in the Islands' economy. It can be shown by using the table of gross domestic product at market prices and its components developed by the INE. We can see, first of all, that approximately 30% of the regional economy comes from the service sector, trade and catering business. Moreover, it stands out the public sector and social services with 18.7%. Emphasize the role that is gradually losing the construction sector.

	2008 (P)	2009 (P)	2010 (P)
GROSS DOMESTIC PRODUCT AT MARKET PRICES	**100.0**	**100.0**	**100.0**
Agriculture, ranching, forestry and fishing	1.1	1.2	1.1
Mining and quarrying, manufacturing, supply of electricity, gas, steam and air conditioning, water supply, sewerage, waste management and decontamination. Of which:	7.5	7.4	7.4
- Manufacturing	4.4	4.0	3.9
Construction	11.3	10.2	9.2
Wholesale and retail trade, repair of motor vehicles and motorcycles, transportation and storage, catering	30.0	30.4	30.4

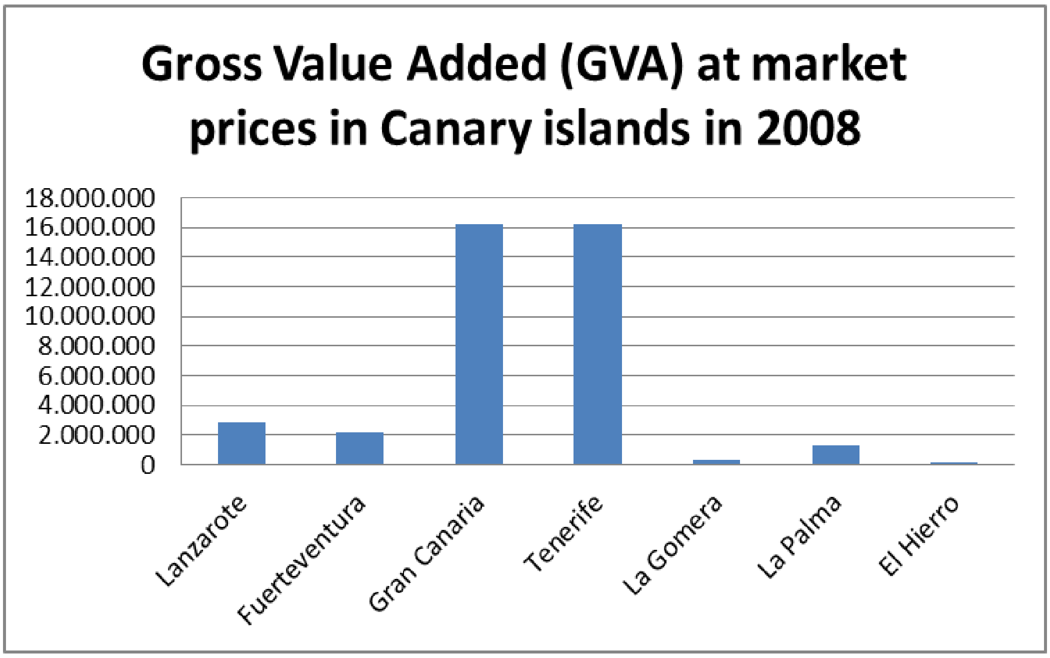
Information and communications	2.7	2.7	2.5
Financial and insurance	3.8	4.2	3.2
Real estate	8.4	7.9	9.1
Professional, scientific and technical, administrative and support service activities	6.0	6.3	6.3
Public administration and defence, compulsory social security, education, human health and social services	17.5	19.0	18.7
Arts, entertainment and recreation, repair of household goods and other services	3.3	3.6	3.4
Total gross value added	**91.7**	**92.9**	**91.5**
Net taxes on products	8.3	7.1	8.5
GROSS DOMESTIC PRODUCT AT MARKET PRICES	**100.0**	**100.0**	**100.0**

Table 9 GDP in Canary in % at market prices 2008-2010
Source: Regional accounts of Spain. INE

It is also important to analyze the contribution that makes each island to the economy of the archipelago. Using the Gross Value Added (GVA) at market prices during 2008, we can see that there are two largest islands which offer greater participation with more than 80%. At the other extreme there are islands like La Gomera and El Hierro which do not reach to 1%.

	GVA	%
Lanzarote	2,889,629	7.36
Fuerteventura	2,154,289	5.49
Gran Canaria	16,182,806	41.20
Tenerife	16,245,473	41.36
La Gomera	360,240	0.92
La Palma	1,277,408	3.25
El Hierro	165,120	0.42
Canarias	39,274,964	100

Table 10 Gross Value Added (GVA) at market prices in 2008
Source: ISTAC



Graph 5 Gross Value Added (GVA) at market prices in Canary islands in 2008

The greatest scourge of the Islands' economy is undoubtedly the high rate of unemployment. In the last three years this ratio has grown to the level of 26.2% in 2009, 28.7% in 2010 and 30.93% in the third quarter of 2011.

Registered unemployment in the Canaries increased strongly in January 2012, in such way that after an increase of 8,414 unemployed in respect to the previous month, registered unemployment raised to the 273,983 people, the largest number of registered unemployed in the Canary Islands to date.

In a social context strongly marked by high unemployment, punishing especially the young, the main bottlenecks facing the employment of new workers are not explained only by a limited labour demand, but also by the low general level of training and professional qualifications and its clear inadequacy of the existing job, probable cause, among others, the frequency of recorded migration.

For the whole of Spain, the registered unemployment figure also strongly increased in January 2012, the way that after a rise of 177,470 unemployed in respect to the previous month, the national unemployment figure increased to 4,599,829, which is also the highest figure to date. The percentage changes are accelerated to 8.7%, reflecting an increase in unemployment in the last twelve months of 368,826 people.

From island-wide estimates made by the ISTAC on the main variables of the EPA we can make an approach to territorial unemployment rate in the Canaries. This shows that in 2011 the eastern islands, the same as in previous years, remain being those with higher unemployment rates, with Gran Canaria (32.0%), Fuerteventura (31.91%) and Lanzarote (31.81%) with above-average rates of Canary Islands. The island with the lower percentage is Tenerife with 27.19%

By provinces, in the last quarter of 2011 the province of Las Palmas had an unemployment rate of 32.36% versus 29.46% of the province of Santa Cruz de Tenerife. The worst thing about it is that it is not expected to improve in the short term as the

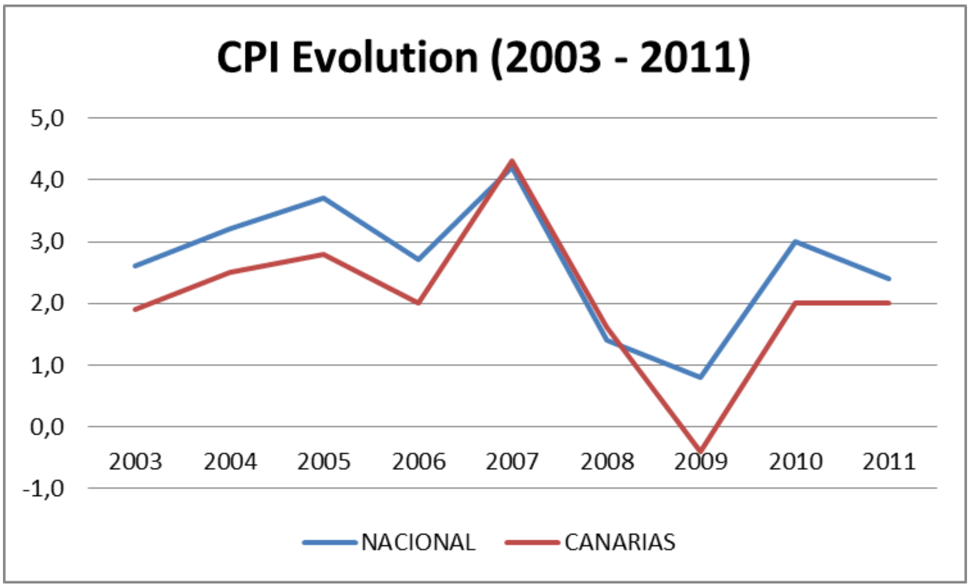
Regional Economics Department of Savings Banks foundation (FUNCAS) predicts that in 2012 regional will exceed 30% versus 23% national.

Analyzing the evolution of prices, in annual terms, inflation is significantly reduced, so that by the end of 2011 the Canary Islands were placed at 2.0% and at 2.4% of national average. With this information Canaries closed the year as the region with lower inflation in the state. Far from being a positive data it reflects the serious stagnation in existing consumption in the islands. In 2010 the data reflected an increase of 2.0% and 3% respectively.

	2003	2004	2005	2006	2007	2008	2009	2010	2011
National	2.6	3.2	3.7	2.7	4.2	1.4	0.8	3.0	2.4
Canary Islands	1.9	2.5	2.8	2.0	4.3	1.6	-0.4	2.0	2.0

Table 11 CPI Evolution 2003-2011

Source: ISTAC



Graph 6 CPI Evolution 2003-2011

Economic activity indicators altogether still do not show as a whole a clear tendency toward recovery. In all economic sectors except tourism, the tendency toward recovery is weak.

As for industrial production in the Canaries, in annual terms, the growth is negative, keeping up the tendency marked by previous years, mainly due to structural reasons mentioned above.

Both the Canary Islands and Spain are still suffering negative growth in retail sales, as the result of the mentioned above decrease domestic consumption.

In the contrast to the above, there are good results of the tourism sector. Only this sector indicators show month after month positive results, strengthening its recovery.

In addition, the accumulated data of arrivals over the last twelve months confirm these good results, also showing a more positive profile in Canaries to the national average, which is undergoing slower progress.

Moreover, ISTAC statistics of travellers and overnight stays at tourist accommodation confirm this trend.

	2011	2010	2009	2008	2007	2006	2005
Canary Islands	10,318,178	8,590,081	7,982,256	9,216,585	9,328,546	9,530,039	9,276,963

Table 12 Tourism evolution in Canary Islands
Source: ISTAC

Regardless the arrival of more tourists the drop on average tourist spending per tourist per day Canary Islands is worrying.

	2011	2010	2009	2008	2007	2006
Canary Islands	36.94	37.72	37.73	39.47	40.50	39.98

Table 13 Canary Islands average tourist spending
Source: ISTAC

The consequence of the drop on tourist spending is the decrease of profit margins of hotel and extra hotel industry. This means a cutback in investment and replacement and upgrading of fixed assets.

The expected outlook on the economy in the coming years is uncertain. The problems of the euro zone countries and bailouts to troubled countries such as Greece, Ireland, Portugal, Italy and Spain, create greater uncertainty about the final solution to the crisis.

Without venturing far, it does not seem that in 2012 or even in 2013 it could be possible to reach levels of growth that can match the boom years of the middle of the last decade and create jobs.

With respect to the island of La Palma the structure of gross value added (GVA) in terms of the representativeness of the industries in 2008 was as follows.

Activity	Participation (%)
Trade, Hotel and Transportation	26.7
Other Services	28.8
Financial Intermediation and Business services	18.3
Construction	15.7
Industry and Energy	7.7

Activity	Participation (%)
Agriculture, Livestock and fishing	2.8

Table 14 GVA in La Palma en 2008

Source: ISTAC. Elaboration: Confederation of Canary Entrepreneurs

On the island of La Palma, its composition focuses particularly on the activities “Other Services” (which includes social services, health, education and those relating to public administration) (28.8%), “Trade, Hotel and transport” (26.7%), “Financial Intermediation and Business Services” (18.3%) and “Construction” (15.7%).

La Palma is one of the Canary Islands with more forest areas, both pine and laurel. The main source of income for the economy comes from cultivation of bananas, with export which surpasses the 130 million kilos.

Furthermore logging out, reaching export to other islands, the snuff, highly respected for its quality, and the almond tree, which also has some commercial attention. They also emphasize the craft of embroidery, and basketry, which was important at the time, but has declined considerably. Livestock is limited to local consumption.

1.4. Political and administrative structure

1.4.1. Institutions with responsibility for energy

The **Ministry of Industry, Energy and Tourism**, is the governing body of State’s General Administration responsible for proposing and implementing government policy on energy, industrial development, tourism, telecommunications and information society.

In addition, the **Institute for Energy Diversification and Energy Savings** (IDAE) is a public company assigned to the Ministry of Industry, Tourism and Trade through the General Secretary of Energy, whose mission is to promote energy efficiency and rational use of energy in Spain, and the diversification of energy sources and promotion of renewable energy. Among its objectives, emphasizes promoting the use of new saving technologies, manage and keep to the savings plans and national energy efficiency cooperating with the European Commission in its management, and support to Spanish companies in obtaining the funds to implement such programmes.

Meanwhile, Spanish **National Energy Commission** is the regulator of energy systems, created by Law 34/1998 of 7th October, of hydrocarbon industry, and developed by the Royal Decree 1339/1999 of 31st July, which approved its Regulations. Its objectives are to ensure effective competition in energy systems and the objectivity and transparency of its operation, to the advantage of all agents operating in such systems and consumers. For this purpose, the electric market and the markets of liquid and gaseous hydrocarbons (natural gas, oil ...) are understood as energy systems.

The company that dedicates to the transmission of electricity is **Red Electrica de España**. It does not make power distribution, and owns nearly 100% of high-tension electricity transmission. In recent years it has acquired new assets of the transmission grid from other companies. It also acts as operator of the Spanish electricity system. Its duties as manager of the transmission grid are to develop and expand the facilities of the same, perform maintenance and improvements under homogeneous and consistent criteria, and managing the flow of electricity among foreign systems requiring the use of Spanish electricity system. In addition, Red Electrica guarantees third party access to the grid, so that all sector agents can use it on the same conditions.

The **Canary Islands Government** is the institution that holds the executive power under the competence of the Canary Autonomic Community conferred by the Canary Autonomy Status, which is the institutional norm that constitutes the Canary Islands, providing it with basic organizational and functional framework. At the top management, and as an exponent of regional executive power, we find, then, with the Canary Islands Government.

On the other hand, **Union Electrica de Canarias**, SAU (UNELCO, known since 2002 as UNELCO-ENDESA) is a Spanish company that dedicates to the generation of electricity, founded in Las Palmas de Gran Canaria in 1930, it had and has control of almost all electricity production in the Canary Islands.

The Canary Islands Government currently has a low voltage electricity market liberalized in the islands, where compete five trading companies authorized by the State. These are Iberdrola, Union Fenosa Metra, Hidrocantábrico and E.ON, and Endesa as well.

In the insular area the governing organ is the **Island Local Government of La Palma.** Like all governments, it has been established according to the Island Local Governments´ Act of 1912. It is a governmentally and administratively own form of Canary Islands, that in addition to the functions of the insular government, provides services and exercises own powers of the Canary Autonomic Community.

Under Article 43 of the Act on the Legal Regime of Public Administrations of the Canaries, the Island Local Government has exclusive powers, among which are:

- Approve Island Plans of Works and Services being developed with the city councils of each municipality. To this end, the city councils make the proposals of works related to the municipality, which may not be modified by the respective Island Local Government, except for good cause and after hearing the council involved.
- Environmental protection
- Rural infrastructure of insular character
- Subrogation of municipal powers on urban planning in accordance with the provisions of the legislation in force.
- Hydraulic works without regional or general interest, maintenance and policing of hydraulic works and insular management of ground waters on the terms lay down by regional sectorial legislation.
- Road and by cable transport. Railways, within those established by the regional sectorial regulations.

Finally, note that each city council has the ability to establish ordinances and regulations specific for each of the existing municipalities.

1.4.2. Legal framework

In the Community framework stands out the **Directive 2009/28/EC** of the European Parliament and Council of 23 April 2009 on the promotion of the use of energy from renewable sources, in which is fixed for each member, a target for the share of energy from renewable sources in gross final energy consumption by 2020. This goal fits with the overall objective "20-20-20" of European Community. Also, before 2020, the share of energy from renewable sources in the transport sector should be at least 10% of final energy consumption in this sector.

Also, Member States should establish a national action plan for 2020 to determine the share of energy from renewable sources consumed in transport, electricity and heat production. These action plans should take into account the effects of other measures relating to energy efficiency in final energy consumption (the most important is the decrease of energy consumption that would be required to produce less energy from renewable sources). These plans must also establish ways to reform the planning regulations and tariffs and access to electricity grids in favour of energy generated from renewable sources.

On other hand, Member States may "exchange" energy from renewable sources by a statistical exchange and develop joint projects related to the production of electricity and heat from renewable sources.

Also, they can establish co-operation with third countries. To do this, they must meet the following conditions: that electricity is consumed in the countries of the European Community, which is produced in a newly constructed installation (after June 2009) and the quantity of electricity produced and exported is not the subject of other support.

The Directive takes into account the energy generated from biofuels and bioliquids. For the latter can be taken into consideration, they should help to reduce at least by 35% the emissions of greenhouse gases. From entering in force from 1st January 2017, its contribution to reducing emissions should reach 50%.

Biofuels and bioliquids produced from raw materials from abroad and from within the Community should not be produced with raw materials from land with high value for biodiversity or showing a large reserve of carbon. To receive financial aid they should be classified as "sustainable" under the criteria of this Directive.

With respect to electricity, stand out the **Directive 2009/72/EC** of the European Parliament and the Council, of 13th July 2009 on common rules for the internal electricity market.

Regarding the transit of electricity it should be mentioned the **Regulation (EC) No. 714/2009** of the European Parliament and the Council of 13th July 2009 on conditions for cross-border trade access to the electricity grid.

As regards security of supply of petroleum products stands out the Council **Directive 2009/119/EC** of 14th September 2009, which obliges Member States to maintain minimum reserves of crude oil or petroleum products.

Biofuels include, the **Directive 2009/28/EC** of the European Parliament and the Council of 23rd April 2009 on the promotion of the use of energy from renewable sources, and the **Directive 2009/30/EC** of the Parliament and of the Council of 23rd April 2009, that amends the Directive 98/70/EC in relation with the specifications of petrol, diesel and gas-oil and introduces a mechanism to control and reduce emissions of greenhouse gases and modifies the Directive 1999/32/EC of the Council in respect of the specifications of fuel used by inland waterway vessels.

Referring the basic legislation on natural gas, at European level the following directives should be mentioned:

- **The Directive 2009/73/EC** of the European Parliament and the Council of 13th July 2009 on common rules for the internal market of natural gas.
- **The Regulation (EU) No. 994/2010** of the European Parliament and the Council of 20th October 2010 on measures to ensure security of supply.
- And finally, the **Regulation (EC) No. 715/2009** of the European Parliament and the Council of 13th July 2009 on conditions for access to natural gas transport grid.

1.4.2.1. National energy policy

1.4.2.1.1 Electrical regulations

Regarding Spanish state legislation it should be mentioned first, as basic law, the **Royal Decree-Law 7/2006** of 23rd June, which adopts urgent measures in the energy sector and corrects certain inefficiencies attributable to energy legislation previously existing.

These corrections are applied to the **Law 54/97** of 27th November, which suppresses the transition costs to competence. Remain the incentives to the consumption of autochthonous coal and to support facilities which develop specific plans of particular technological relevance. Also, a bonus scheme is approved up to 10 euros per MWh produced.

It also stands out the **Law 17/2007** of 4th July that amends the Law 54/1997 of 27th November in order to adapt it to the common rules for the internal electricity market.

Also by this **Royal Decree-Law 6/2009** of 30th April the measures are adopted in the energy sector and the social bond is established.

As development of the Royal Decree Law 6/2009, it is published the **Royal Decree 437/2010** of 9th April, which implements the securitization process control of electrical system deficit.

The Law 25/2009 of 22nd December involves the modification of legislation relevant to its adaptation to the law on free access to activities and its implementation. Therefore, this law affects the exercise of activities to be undertaken by certain agents in the electricity sector.

Subsequently, it was published the Royal Decree 198/2010 of 26th February, aimed at developing the provisions of Law 54/97 of 27th November of electricity sector and amended by the Law 25/2009 of 22nd December with the purpose to adapt existing regulations to the new requirements specified in this rule.

The Royal Decree-Law 6/2010 of 9th April takes steps to establish new activities for upgrading the energy sector and thus promote an employment and economic recovery.

Finally, to be mentioned the Royal **Decree-Law 14/2010** of 23rd December that establishes the urgent measures for regulating the power sector tariff deficit which affects photovoltaic installations covered by the Royal Decree 661/2007, limiting the hours of production according to the climate zone where the installation is located, although in 2011, 2012 and 2013 the hours shall be limited regardless of its location. On the other hand, it extends the deadline to receive the regulated rate to 28 years.

Regarding the economical and technical functioning of island and mainland systems (SEIE), the regulatory framework is formed by **Royal Decree 1747/2003** of 19th December, that regulates the island and areas outside the mainland electrical systems and the Decrees **ITC/913/2006** and **ITC/914/2006**, published on 31st March 2006, that define the basic rules of economic and technical operation of mainland electrical systems and provides the implementation of the System Operator and Market Operator on the areas outside the mainland.

These rules are to be completed by the **Resolution of 22nd May 2009** that approves the settlement system rules and payment guarantees of the mainland and areas outside the mainland systems and with the Decree **ITC/1559/201** of 11th June which regulates aspects of the mainland and areas outside the mainland regulation electricity systems.

With regard to the remuneration of transmission and distribution of electricity activities, there are the following regulations:

- The **Royal Decree-Law 325/2008** of 29th February that establishes the remuneration of the transmission of energy for installations put in service from 1st January 2008.
- The **Decree ITC/368/2011** of 21st February that approves unit values of reference or investment costs and operation and maintenance of transmission facilities, per fixed element, which shall apply to facilities, put in service from 1st January 2008.
- **The Royal Decree 222/2008** of 15th February, which establishes the remuneration of the activity of electricity distribution.
- **The Royal Decree 1202/2010** of 24th September, which establishes deadlines for inspection of tolls of access to transmission and distribution electricity grid.

There are other regulations related to transportation and distribution, such as:

- **The Royal Decree 1110/2007** of 24th August, that approves the unified rules of measurement points of the **electrical system.**
- **The Royal Decree 223/2008** of 15th February, that approves the regulation on technical and security guarantees in high-voltage power lines and their complementary technical instructions.
- **The Decree ITC/2906/2010** of 8th November, that approves the annual programme of facilities and exceptional performances of the transport networks of electricity and natural gas.

With respect to electricity supply, it is interesting to mention the approval of the **Law 17/2007** of 4th July that modified the Law 54/1997 of 27th November, of the electricity sector, in order to adapt it to the provisions of the directive 2003/54/EC. This law becomes a new model in which the tariff supply activity and is no longer part of the distribution activity and supply becomes exercised by marketers in free competition being the consumers who freely choose their supplier. Also, with the Law 17/2007, it is established the obligation to create the rates of last resort.

In this context, it is published the Royal Decree 485/2009 of 3rd April, by which is regulated the implementation of last resort supply in the electricity sector. As development of this royal decree, it is published ITC/1659/2009 Order of 22nd June, which provides a mechanism of tariff market customers transfer to the last resort supply of electricity and the calculation procedure and the structure of electricity last resort tariffs.

1.4.2.1.2 Renewable energy policy

Meanwhile, in terms of current legislation on renewable energy within the national sphere, we find a lot of provisions approved in recent years, in order to promote the use of them.

With regard to cogeneration, we find the **Royal Decree Law 7/2006** of 23rd June, according to which urgent measures in the energy sector are adopted. This royal decree eliminates the need for electricity consumption in plants that use cogeneration, focusing not only on the electricity surplus, but all co generated electricity.

By the **Royal Decree 616/2007** of 11th May on the promotion of cogeneration, it is intended to lay the basis for establishing a stable framework for the promotion and public support for high-efficiency cogeneration in order to allow both maintenance of existing facilities and the development of new ones, thus increasing energy efficiency and saving the country's primary/raw energy.

Given the great relevance for the promotion of renewable energy, it should be mentioned the **Royal Decree 661/2007** of 25th May, which regulates the activity of electricity production in special regime. Thus the renewable energies become to be regulated within the special regime, along with the cogeneration and waste treatment.

It also establishes a transitional economic system for facilities belonging to their scope of application. In addition, the **Royal Decree 661/2007** determined a premium/bonus for power plants above 50 MW which were using renewable energy (excluding hydro), cogeneration and facilities of co-combustion of biomass and / or biogas.

The most significant changes that this Royal Decree asserts against the previous regulation are:

- The remuneration of the special scheme is not linked to the Average Tariff or of Reference one. The updating of tariffs, bonuses and allowances/supplements will be linked to the evolution of different factors (such as the CPI or the price of natural gas).
- Set a reference premium and upper and lower limits for generation from renewable energies that participate in the market.

- Set a guarantee that must meet the special regime facilities to request access to the distribution grid. The guarantee was already necessary in the case of producers who would like to connect to grid of transport.
- New wind farms should be able to stay connected to the grid to a brief voltage drop across it.
- Hybridization permits biomass facilities and solar thermal ones.
- Obligation of the special regime of installed capacity/power above 10 MW to be connected to a control centre.
- The right of the special regime to a fee/tariff, to which the distributor will be its representative for participation in the market until 31/12/2008. The distributors will start to charge in the special regime for this service a fee of 0.5 c € / kWh from 1/07/2008.
- The costs of facilities deviations will be applied in the special regime to a tariff that should have time measurement equipment.

Meanwhile, the **Law 17/2007** 4th of July, states that the government may determine a premium for those facilities of co generated electricity production or those that use as primary energy, non-consumable and non-hydraulic renewable energies, biomass, biofuels or agricultural residues, livestock or services, even though the installed capacity exceeds 50MW.

In November 2011 the **Plan to Promote Renewable Energies** was modified in order to adapt it to the goals established by the European Union, in this regard, of 20% by 2020, maintaining the commitment of 12% that this plan established for 2010. These objectives will be taken into account in fixing the premiums for these installations.

With regard to photovoltaic installations, the Resolution of September 2007 establishes the period of maintenance of the regulated tariff for photovoltaic technology.

Subsequently, the **Royal Decree 1578/2008** of 26th September is published, on remuneration of the electricity production activity by means of photovoltaic solar technology for installations after the deadline for the maintenance of the remuneration of the Royal Decree 661/2007 of 25th May, for this technology.

Finally, in relation to photovoltaic installations should be mentioned the **Royal Decree 1003/2010**, of 5th August, which regulates the settlement of the premium equivalent to the electricity production facilities of photovoltaic technology in special regime. This Royal Decree establishes the procedure for the accreditation of different photovoltaic systems when entering the different compensation frameworks that the current law provides for these installations.

In the same line as for photovoltaic installations, and because of the economic impact that suppose renewable energies on the tariff system, it is approved the **RD-Law 6/2009** of 30th April according to which one are adopted certain measures concerning energy sector and the social bond is approved.

The Resolution of 19th November 2009 of the Secretary of State for Energy, by which is published the Council of Ministers Agreement of 13th November 2009 that proceeds the management of projects or facilities submitted to the administrative record of pre-allocation for facilities producing electricity, provided by the **Royal Decree-Law 6/2009**

of 30th April which adopts certain measures in the energy sector and establishing the social bond.

Related to the above provisions, should be mentioned the following rules that affect the facilities in the special regime:

- **The Royal Decree 1565/2010** of 19th November, which regulates and modifies certain aspects related to the activity of electricity production in special regime. This RD responds to the growing number of production electricity facilities from renewable energy sources, cogeneration and waste, and photovoltaic systems.
- **The Royal Decree 1614/2010** of 7th December which regulates and amends certain aspects of the activity of electricity production from wind and solar thermoelectric technologies. This decree establishes a limitation of equivalent operating hours eligible for premium or premium equivalent and also /plus a reduction of them.
- **The Royal Decree-Law 14/2010** of 23rd December that establishes urgent measures to correct the revenue shortfall/tariff deficit in the electricity sector. This Royal Decree provides, in general, the possibility of limiting the hours of operation with a right equivalent to the regime have recognized that economic primacy. Thus, these values are set explicitly of reference in accordance with the values used for calculation of remuneration set out in the Renewable Energy Plan 2005-2010 and those reflected in the **Royal Decree 661/2007** of 25th May that regulates the activity of electricity production in the special regime, taking into account the solar climatic zone where the facility is located, according to the classification of climatic zones according to the average solar radiation in Spain established in the Royal Decree 314/2006 of 17th March that approves the Technical Building Code. At the same time and in order to ensure the reasonableness of the compensation is extended to 28 years for the facilities of b.1.1 type, references within the first 25 years established in the Royal Decree 661/2007 of 25th May.

Recently, in order to encourage the installation of renewable technologies to reduce power consumption in the tertiary and domestic sectors, it was promulgated the **Royal Decree 1699/2011** of 18th November, which regulates the connection to electricity production facility grid of small power. This R.D. is repealed by the Royal Decree 1663/2000 of 29th September and, as a novelty, simplifies requirements for small power plants that seek to connect at points where there is already a supply.

Other provisions related to renewable energies are:

- **The Order ITC/1522/2007** of 24th May establishes the regulation of the guarantee of origin of electricity from renewable energy sources and high efficiency cogeneration.
- **The Order ITC/1673/2007** of 6th June approves the programme on conditions of application of input power/contribution to the electrical system associated with certain producers and consumers who help ensure security of electricity supply.

Regarding the authorization of the facility, there is also the **Royal Decree 1028/2007** of 20th July, which establishes the administrative procedure for processing applications for approval of electric generating facilities in the territorial sea.

The Law 2/2011 of 4th March, of sustainable economy, is very important and deserves to be mentioned specially because of its transversely and structural approach to a lot of changes, with force of law, which are necessary to encourage and accelerate the development of a more competitive, more innovative economy able both to renew the traditional productive sectors and decidedly open to new demanding activities of stable and quality employment.

This law sets out the broad principles applicable in the matter, that is, the ensuring security of supply, economic efficiency and environmental respect as well as national targets for 2020 on energy savings and efficiency and use of renewable energy consistent with those established in the European Union and derived an energy model that, by planning instruments under the same law, seek to increase the share of renewable energy, increase the predictability and efficiency of decisions of energy policy and in particular the incentive framework and reduce the participation of more potential energy CO_2 emissions. On the other hand, it promotes cooperation among Public Administration, under the Energy Sector Conference, and encourages research, development and innovation in renewable energy and energy savings and efficiency, with special attention to new obligations for Public Administration.

Given its special importance for the Canaries, it included the fourteenth additional provision of the law, regarding the development of the Comprehensive Strategy for the Canary Islands Autonomic Community. It identifies that the Government will pay attention to the specific characteristics which contribute to the Canary Autonomic Community as a peripheral region, because of its remoteness, insularity and population dispersion.

In particular, the Government will take into account the specific conditions of the Canaries and the requirements set out in the Community Energy Plan in renewable energy. For this purpose special quotas for renewable energy are established in the Canary Islands in response to technical and economic criteria when they are competitive with conventional technologies in each of the subsystems of SEIE of Canaries. So, the technology needs to support renewable generation will be revised, in order to ensure power system stability Canary, as provided in the regulations of the SEIE.

Due to the present economic situation in the country the **Royal Decree-Law 1/2012** of 27th January is published, by which it proceeds to the suspension of pre-allocation procedures and the removal of economic incentives for new production of electricity facilities from cogeneration, renewable energies and waste.

1.4.2.1.3 Legislation related to oil

What is referred to security of supply of petroleum products, include the **Royal Decree 1766/2007** of 28th December, regulating the obligation to maintain minimum security stocks, the diversification of natural gas supply and strategic reserves corporation of petroleum products.

In terms of specifications for petroleum products, the **Royal Decree 61/2006** of 31st January should be mentioned which determines the specifications of petrol, diesel, fuel oils and liquefied petroleum gases and regulates the use of certain biofuels.

Referred to liquefied petroleum gas (LPG) it emphasizes the **Royal Decree 919/2006** of 28th July, which approves the technical regulation of distribution and use of gaseous fuels and their supplementary technical instructions ICG 01 to 11.

As for the prices of LPG, the **ITC/1968/2007 Order** of 2nd July, updates the system for automatic determination of maximum retail prices, before tax, of bottled liquefied petroleum gases and modifies certain provisions on hydrocarbons.

The **ITC/1858/2008 Order** of 26th June updates the system for automatic determination of maximum retail prices, before tax, of bottled liquefied petroleum gases.

The **Order ITC/2608/2009** of 28th September amends the previous Order ITC/1858/2008 of 26th June, in the sense of modifying the final weight of freight in the regulated price and establishes a formula for annual review of the marketing costs.

Finally, the **Order ITC/3292/2008** of 14th November amends the system of automatic determination of the rates of sale, before tax, of liquefied petroleum gases by pipeline.

As mentioned oil installations only, the **Royal Decree 1416/2006** of 1st December approves the Technical Additional Instruction MI-IP 06 "How to leave out storage tanks of liquid petroleum products".

Regarding the transfer of information, the **Royal Decree Law 6/2000** establishes the obligation to inform the general direction of energy policy and mines about the prices on gas stations, both by operators and owners of independent service stations. This obligation has been further developed by the Order ITC/2308/2007 of 25 June, which determines how to send information to the Ministry of Industry, Tourism and Trade on the activities of supply of petroleum products.

Besides, the **Resolution of 29th May 2007 of the General Directorate for Energy Policy and Mines** approves the new official forms for submission of information to the General Directorate for Energy Policy and Mines, the National Energy Commission and the Strategic Reserves of Petroleum Products.

With respect to biofuels, it includes the **Royal Decree 1088/2010** of 3rd September, amending the Royal Decree 61/2006 of 31st January regarding the technical specifications for gasoline, diesel and use of biofuels and sulphur content of marine fuels. With this royal decree transposing Directive 2009/30/EC as regards the specification of petrol and diesel, modifies aspects of the use of biofuels and makes changes related to the specification of fuel used by inland navigation vessels.

Concerning the degree of penetration of biofuels and other renewable transport and other renewable fuels for transport purpose, first, the **ITC/2877/2008 Order** of 9th October establishes a mechanism to promote the use of biofuels and other renewable fuels for transport purposes. The sixteenth additional provision of Law 34/1998 of 7th October, the hydrocarbon sector, sets annual targets for biofuels and other renewable fuels for transport, which are mandatory targets from 2009, and reach the 5.83% in 2010. Furthermore, it enables the Ministry of Industry, Tourism and Commerce to issue the necessary provisions for a mechanism to promote the incorporation of biofuels and other renewable fuels for transport purposes.

On this basis, this Order establishes minimum targets by product type, temporal flexibility mechanisms to account for the amount of biofuels sold or consumed, and a system of certification and compensation payments to be managed by the Energy National Commission will obligated to transfer certificates, while served as a control mechanism of the obligation.

This is expected to reach an overall target of 7% of the energy content of petrol and diesel sold for transport purposes.

To contribute to the development of this order Circular 2/2009 of 26 February is issued, the National Energy Commission, which regulates the implementation and management mechanism to promote the use of biofuels and other renewable fuels for transportation purposes.

Finally, the **Decree 459/2011** of 1st April sets mandatory targets for biofuels for 2011, 2012 and 2013.

Therefore, the objectives set out in the **Royal Decree 1738/2010** of 23rd December on biofuels in diesel rise to 7.0% and the global objectives of biofuels, rise to 6.4%, 6.5 % and 6.5% in the same years. Taking into consideration the date of entry into force of this Royal Decree and the time required to consume the product currently on the system, the global objective for 2011 is set at 6.2% and the target for biofuels in diesel at 6.0%.

1.4.2.1.4 Legislation related to natural gas

In the field of natural gas, the **Law 12/2007** of 2nd July is included, that amends the Law 34/1998 of 7th October, of the hydrocarbon sector, in order to adapt to the provisions of the Directive 2003/55/EC of the European Parliament and the Council of 26th June 2003 concerning common rules for the internal market in natural gas.

On the other hand, the **Royal Decree 326/2008** of 29th February establishes the remuneration of the transport activity of natural gas for installations put into service from 1st January 2008.

Finally, **Royal Decree 197/2010** of 26th February amends certain provisions related to the hydrocarbon sector to the provisions of the Law 25/2009 of 22nd December, for its amendment of various laws to adapt to Law on free access to activities and its exercising.

1.4.2.2. Canary energy legislation

1.4.2.2.1 Electricity regulatory

As for the general measures taken by Canary Autonomic Community in electricity field we can find the following:

- The **Law 2/2011** of 26th January, that amends the Law 11/1997 of 2nd December, regulating the canary islands electricity sector and the Law 19/2003 of 14th April, approving General Management Guidelines and the Guidelines on Tourism of the Canary Islands. The act also amends Article 6-bis of the Law 11/1997 of 2nd December, regulating the Canary electricity sector as amended by the Law 8/2005 of 21st December.
- The **Law 8/2005** of 21st December, amends the Law 11/1997 of 2nd December, of regulating the Canary electricity sector, it has a main purpose to face the problems

that from the point of view of the territorial generic or urban rules, difficult to deal with situations that arise as a matter of urgency or exceptional interest in the Canary electrical system, the same as in the generation and in transmission and distribution.

- In terms of approval of electrical installations, it includes the **Decree 141/2009** of 10 November, which approves the regulations on the administrative procedures governing the implementation and commissioning of electrical installations in the field of the region.
- The **Order of 16th April 2010** approves the special rules for liaison facilities in the Canary Islands.

On the other hand, the **Law 6/2009** of 6th May is published, on urgent measures in territorial planning for the revitalization and management sector of tourism. It should be noted that paragraph 7 says that in the protected rural land because of their economic value can be deploy networks and power lines, hydraulic and communications, without requiring Territorial Rating, always when there is no expressed prohibition in the Island Plan Management in Territorial management Plans of Orientation or in the planning of protected natural areas that are applicable to the area where the installation should be placed and carried out in a underground way. The performance of these nets and lines will be subject to environmental assessment that in this case should be obtained the relevant municipal license.

The same rules apply to processing power stations, compactly prefabricated or covertly run, and small telecommunications entity, excluding towers or repeaters communication centres and supply depots for public water up to 4,000 m³ of underground construction, not exceeding 1 m in height measured from the natural ground elevation.

1.4.2.2.2 Renewable energy legislation

Meanwhile, in renewable energy, was approved by **Decree 32/2006** of 27th March, which regulates the installation and operation of wind farms in Canary Islands. This decree is issued for the purpose of ordering the establishment of wind farms on the islands, so as to facilitate the maximum development of wind energy without compromising the quality of electricity supplied to end users.

This decree regulates the installation and operation of wind farms of an output exceeding 10 kW grid-connected electricity distribution or transportation of any of the island electrical systems. Are excluded, the mini-wind turbines, whose influence on the network is not relevant.

It also sets the maximum wind power that can be installed and connected to the network in 2015 in the island electrical systems, for the case of mains La Palma is 28 MW. It also sets the tender procedure taking into account, mainly energy efficiency criteria, environmental protection, security of supply and condition the electrical system, which will be specified in the relevant calls. All this is in order to achieve the establishment of integrated solutions that streamline the use of scarce existing soil in the Canary Islands, to limit the environmental impact, and provide comprehensive treatment to the electricity infrastructure.

Therefore, only can be granted an administrative approval for the installation or expansion of wind farms, to whom have obtained previously by public tender for the purpose, the corresponding wind power. The upgrading of existing parks, which are not associated with consumption facilities and wind farms engaged in research and technological development connected to electricity grids and those associated with energy accumulation singular systems, which must apply for the extension of pre-allocation of power are exempt from going to public tender

Yet, the **Decree 7/2011** of 20th January amending the Decree 32/2006 of 27th March regulates the installation and operation of wind farms in the area of the Canary Islands. This amendment relaxed the rules and conditions for wind turbines with associated energy storage systems, in particular, the requirements for implementing them. It also establishes the compulsory of the report of the system operator and extends the deadline for resolving the proceeding six months setting, express the sense of rejection to the silence.

As development of the Decree 32/2006 the **Order of 15th November 2006** is included, by establishing technical and administrative conditions for the repowering of existing wind farms. And it regulates the installation and operation of wind farms located in the area of the Canary Islands.

By the **Order of April 27 2007**, the allocation of power in the form of new wind farms intended to pour all the energy in the Canary island electrical systems was called to a public tender and the Order of 17th May 2007 was rules by governing the Periodic Inspection of the low voltage electrical installations.

Order of May 17th 2007, by announcing a public competition for allocation of power in the form of installation or expansion of consumption associated with wind farms in Canary Islands power systems.

1.4.2.3. Specific regulations in La Palma

Regarding specific regulations in the island of La Palma, there is a document of **Advance of Special Territorial Plan of the Energy Infrastructure Planning**, which studies the current situation and existing problems, thus determining the forecast consumption of land for future energy infrastructures and their conditions: oil, electricity generation in ordinary regime electricity transmission, wind, solar, geothermal, tidal power, wave power, hydro and mini hydro, biogas and hydrogen.

2. GLOBAL STRATEGY

2.1. Current framework and future vision

The coal is introduced in Canary Islands in the nineteenth century, imported, almost entirely from Great Britain. It was used mainly to drive the boats and also for street lighting and domestic use, but it was only from the middle of the century when it began to be used to generate electricity. In the first half of the twentieth century it disappeared as fuel with the introduction of oil and its derivatives at the beginning of the last century.

Consumption of fuel oil, whose evolution is linked to electricity generation, increased considerably in the same way as the new plants were built and expanded existing ones and expanding the distribution grids. It is also noteworthy, the use of fuel in the water treatment plants whose development, given the need for water in certain islands, has been growing in recent years.

The energy situation in La Palma and the rest of the archipelago is characterized by heavy dependence on foreign energy. In the 70's the first great oil crisis (1973) occurred, and with it arose, in the Canaries, the need to diversify the energy sources.

The power supply is essential for the functioning of our society, adding a strategic value to all economic sectors. It is, therefore, an essential goal in defining energy policy, that energy supply takes place under optimum conditions of security, safety and quality, all of them with the utmost respect to environmental criteria.

One of the main advantages of designing an energy plan is that it requires designing scenarios for the future, even being uncertain for the long-term projection and volatile world energy markets can limit the risk areas and allow great possibilities of .action.

The main objectives mentioned in the different Energy Plans that have been developed in the Canary Islands since the early 80's have been, among others, increasing the penetration of renewable energy generation park of the island (in order to diversify the energy mix and reduce this heavy dependence, the same as CO_2 emissions).

The first Canary Islands Energy Plan, approved by the Parliament of the Canary Islands in 1980 (PECAN 86), advocates the introduction of coal as the new option (at that time, the European Community prevented from using natural gas to generate electricity). The introduction of coal plants in the vicinity of tourist areas has issued great controversy, which led to the Canary Islands Government to reconsider the situation, weighting up the use of natural gas in plants of combined cycle. This is why in 1989 another Canary Islands Energy Plan was written, PECAN 89, approved by the Parliament of Canary Islands in 1990.

In the range of this Autonomic Community, the current energy policy is contained in the Canary Islands Energy Plan 2006 (PECAN 2006) - approved by the Parliament of Canary Islands, in sessions of 28th and 29th March 2007 - which constitutes the basic indicative document activities to develop in the energy sector, both within the government, and companies involved in energy supply of energy users.

Future energy planning is aimed at ensuring energy supply, promoting rational energy use and maximum utilization of endogenous energy sources, integrated in the environmental aspect for sustainable development in the region.

2.2. Objectives and targets

The objectives proposed are oriented to encourage electricity generation from clean technology. In this sense, it is committed to promote maximum penetration of renewable energy and entering of natural gas, first of all in the electricity generation sector and additionally, in other applications.

Four basic objectives are set, which are summarized as:

1. Ensure power supply to all consumers in optimum conditions in terms of regularity, quality and price.
2. Making the most rational use of energy, which involves minimize its use maintaining, both at the public level, as a whole and the general economic system, an equivalent level of satisfaction measured in terms of environmental quality, social positive impacts and maintaining the competitiveness of our business.
3. To promote the highest possible use of renewable energy sources, especially wind and solar ones as a way to reduce the external vulnerability of the economy system and improve the environmental protection.
4. Integrate the environmental dimension in all energy decisions contributing to progress on the path towards sustainable growth of the region.

The following table summarizes the objectives to achieve with this plan and goals to achieve:

	Objectives	Targets
1.	**Ensure power supply**	Strategic stocks of hydrocarbons to ensure a minimum autonomy of 90 days
		Increased use of autochthonous sources to reduce dependence on outside energy
2.	**Promote the rational use of energy**	Reduce by at least 25% the ratio between energy and GDP in respect of 2005
3.	**To encourage maximum use of renewable energy sources**	Use of autochthonous sources to increase up to 20% the participation of renewable energy resources in primary energy demand
4.	**Integrate the environmental dimension in all energy decisions**	Reduce by at least 20% of CO_2 emissions compared to 2005

Table 15 Objectives and targets to achieve

2.3. Strategic guidelines

The solution to reduce energy dependence and emissions of greenhouse gases, goes through the strengthening the promotion of autochthonous renewable and clean energies use, which will favour the improvement in energy supply security and, at the same time encourage savings and energy efficiency as a complementary part of this proposal.

As for the contribution of renewable energies to energy supply, it is clear that it should be enhanced very significantly, because of being endogenous sources that consequently, reduce energy imports and vulnerability of the energy system. La Palma has to go for achieving the EU target set out in the Directive 2009/28/EC of 23rd April 2009 that promotes the use of energy from renewable sources, relying primarily on an intensive development of wind and solar energies abundant renewable recourses with technologies mature for their mass exploitation.

The strategies have been developed for the mentioned above objectives. They are detailed in the following table:

	Objectives	Strategic guidelines
1.	**Ensure power supply**	Diversification of energy sources and promotion of autochthonous sources
		Maintenance of strategic stocks of hydrocarbons
		Sufficient stocks capacity to meet expected demand growth and to solve specific problems
		Public service obligations with satisfactory conditions of supply and quality of service
		Extra costs compensation regarding the rest of national territory in the electricity and natural gas sectors
2.	**Promote the rational use of energy**	Reducing the ratio between energy and GDP by increasing the global efficiency of the electricity sector and reducing consumption of petroleum products in the transport sector
3.	**To encourage maximum use of renewable energy sources**	Participation of renewable sources in energy supply and electricity generation by means of an intensive use of wind, solar photovoltaic and termic energies. It does not stand out the use of another renewable sources that can reach appropiate levels of technological development, reliable use and costs
4.	**Integrate the environmental dimension in all energy decisions**	Reduce the emission of greenhouse effect gases associated with energy consumption
		Increase the transparency in decision-making related to new energy infrastructure

Table 16 Strategic guidelines to be followed by objective

With the plan, being articulated according to the presented lines, it is intended to enable both the Government and energy supply companies to gain commitments to public opinion, to define time-limited actions for the implementation. On the other hand, it is a call to public awareness in general, as the solution to the energy challenges involves not only the participation of Government and business sector, but also end users, who have decision-making capacity when it deals with the choice of technologies or measures of rational use of energy.

3. ENERGY BALANCE AND QUANTIFICATION OF EMISSIONS

In this section we analyze the energy situation in the island based on the current situation, considering as reference the year 2005. The base year analysis is performed using data that are obtained from the different authorities and companies involved in the energy sector.

Once having defined the situation of reference is the estimation of the energy situation in 2020, is proceeded considering, on one hand, a trend development according to the progression of the last years for which data are available, and on another hand, the expected situation from the measures proposed in this plan of action.

The energy analysis for the three considered matters is divided into:

- Primary energy: Energy obtained from sources of imported energy or local ones (fossil fuels, hydropower, wind, solar, biomass, etc.).
- Secondary energy: the energy converted from other types of energy to power users (electricity, heat for urban heating, cold for district cooling).
- Final energy: It means commercial energy supplied to end users (electricity, heat, cold and fuels) and renewable energy sources used directly by end users, excluding the energy sold to a public distribution grid (solar, biomass, etc.).

3.1. Baseline

This section will detail the different energy consumption by sectors and energy sources, using available data from different sources. We study the final energy consumption of petroleum fuels, electric power from classification codes of the National Code of Business Activities (CNAE) and renewable sources that exist on the island, studying the existing technologies in the island for the production of electricity and fuel consumption associated with them.

Nowadays and as it is deduced from this analysis, the degree of energy dependence of the island on oil and its derivatives is almost 100% and energy diversification is almost nil.

3.1.1. Primary energy demand

Primary energy is all forms of energy available in the nature before being converted or transformed, and from which energy needs are met for final consumption.

In some cases these energies are consumed directly to obtain mechanical energy or heat or turning it into electricity, known as secondary energy.

Besides this classification, between primary and secondary energy, we can distinguish between renewable energy and non-renewable.

Primary energy available on La Palma mainly comes from fossil fuel derived oil for internal use plus renewable energy, wind and solar, in form of solar thermal and photovoltaic.

Some of the supplies of petroleum products are used directly for the final consumption of different economic sectors and residential use. The rest is used for processing power. Renewable energies are mainly used for electricity production both for the connection to the grid and in the self consumption way, except for solar thermal water heating.

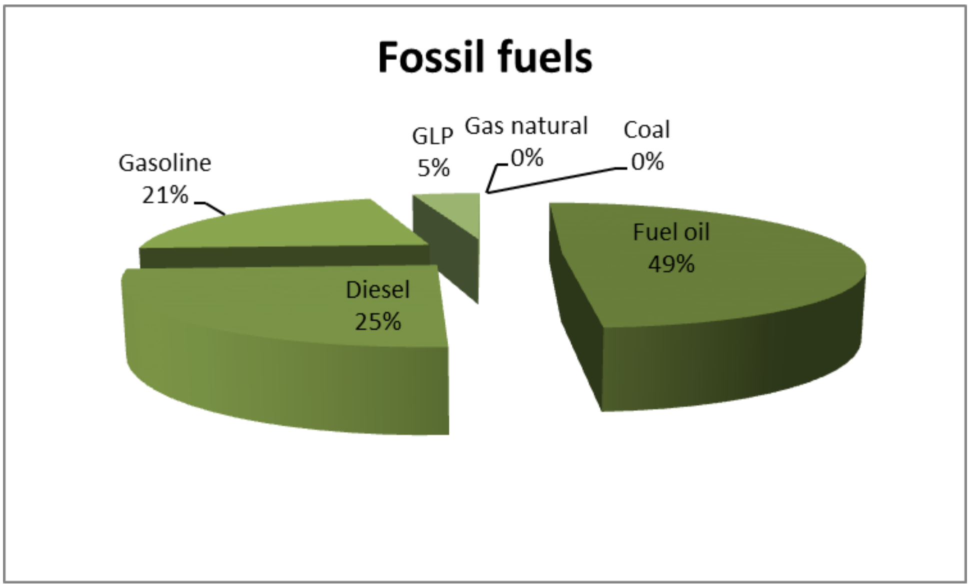
3.1.1.1. Fossil fuels

As it can be seen in the following table, the diesel (diesel oil and diesel) and fuel oil are the most used fuels in the island.

Fossil fuels	MWh	%
Fuel oil	591,666	49.00%
Diesel	302,938	25.09%
Gasoline	257,891	21.36%
LPG	55,086	4.56%
Natural gas	0	0.00%
Coal	0	0.00%
Subtotal	1,207,581	100.00%

Table 17 Fossil fuel demand in La Palma

These fuels are mainly used in the processing power. In addition, diesel and gasoline are used primarily in the transportation sector, while the LPG (liquefied petroleum gas), especially butane and propane are the most used, in the residential and tertiary sectors respectively.



Graph 7 Fossil fuel demand in La Palma

As you can see from the graph, fuel oil accounts for 49% of total demanded fossil fuel. The diesel (gas oil and diesel oil) 25% and 21% gasoline. Finally, LPG (butane) 5%.

3.1.1.2. Renewable energies

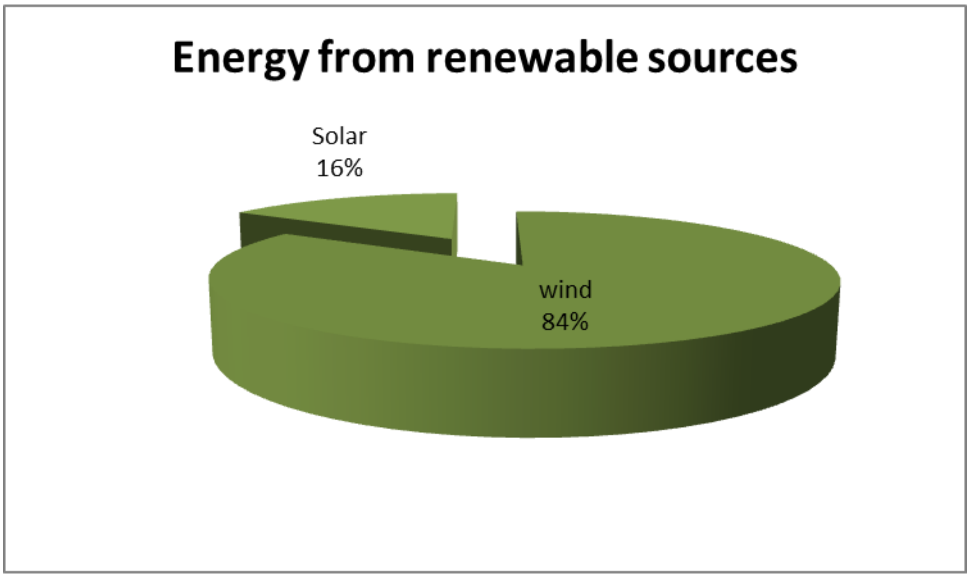
The island has two types of renewable energies, wind and solar (the latter takes into account both thermal and photovoltaic).

Renewable energy sources	MWh	%
Hydraulic	0	0.00%
Wind	11,190	84.01%
Solar	2,129	15.99%
Geothermal	0	0.00%
Marine	0	0.00%
Biomass	0	0.00%
Municipal waste	0	0.00%
Energy recovery	0	0.00%
Subtotal	13,319	100.00%

Table 18 Renewable energies in La Palma

Among existing renewable energy in La Palma, the wind power generated by the four wind farms present on the island (5,880kW), accounts for 84% of the total. The solar represents the remaining 16%, mainly solar thermal used for DHW heating in the tertiary sector and domestic one. The solar photovoltaic is used mostly for self-consumption in off-grid installations 632.06 kWp.

Until 2003, the island had small hydro plant of El Mulato, stopped in 2005 due to technical problems, so it has not been considered in the base year study.



Graph 8 Energy produced in La Palma from renewable energy sources (2005

As it can be seen, the island has a significant dependence on energy resources that force it to import petroleum products in order to meet the demand (98.91%).

The contribution of generation systems from renewable sources is very low, barely 1.10%.

3.1.2. Production of secondary energy

The island has centralized power, without having any type of centralized services in order to meet the demands of heat or cold.

The production of secondary energy and energy flows in La Palma are reflected in the following table:

Energy products	Fossil fuels MWh	%	Renewable energy sources (connected to public grid) MWh	%	Total MWh	%	Losses	%
Electricity	243,693	100.00%	11,197	100.00%	254,890	100.00%	40,069	15.72%
Heat	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cold	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	243,693	**100.00%**	**11,197**	**100.00%**	**254,890**	**100.00%**	**40,069**	**15.72%**

Table 19 Secondary energy production and energy flows in La Palma

3.1.2.1. Description of the production systems

The primary energy is converted into secondary energy in 2005 is as follows:

Energy products	Fossil fuels MWh	%	Renewable energy sources (connected to public grid) MWh	%	Total MWh	%	Losses	%
Electricity	599,874	100.00%	11,197	100.00%	611,072	100.00%	356,181	58.29%
Heat	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cold	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	599,874	**100.00%**	**11,197**	**100.00%**	**611,072**	**100.00%**	**356,181**	**58.29%**

Table 20 Primary energy, that becomes secondary energy in La Palma

As mentioned before, the electricity demand of the island is primarily covered with fuel oil (98%) and diesel (2%) from the power plant of Guinchos located in Santa Cruz de la Palma, capital of the island. This plant has the following generating units:

Central	Technology	Nº Groups	Unit power (kW)	Total power (kW)	Current fuel
Los Guinchos	Motor Diesel	2	12,600	25,200	Fuel Oil
Los Guinchos	Motor Diesel	2	7,520	15,040	Fuel Oil
Los Guinchos	Motor Diesel	1	5,040	5,040	Fuel Oil
Los Guinchos	Motor Diesel	3	4,320	12,960	Fuel Oil
Total				**58,240**	

Table 21 Conventional generation units in La Palma

In addition to the power station, the island has four wind farms.

Wind farm	Technology	Nº Groups	Installed capacity (kW)	Since
Juan Adalid	Made	7	180	1994
Fuencaliente	Made	5	300	1998
La Palma Airport	Made	2	650	2003
Manchas Blancas	Izar Bonus	3	600	2003

Total			**5,880**	

Table 22 Wind farms in La Palma

The rest of the energy discharged into the grid is generated from five photovoltaic plants connected in a special regime.

Photovoltaic farm	Total power (kWp)	Location
Los Llanos	25.44	I.F.P. José María Pérez Pulido
Cristoph Ketterle	1.62	Puntagorda
ITC La Palma	5.00	S.C. de la Palma
Remo Solar	600.00	El Paso
El Corazoncillo	1,000.00	Los Llanos de Aridane
Total	**1,631.06**	

Table 23 Photovoltaic farms n La Palma

3.1.2.2. Description of the distribution system

The island of La Palma has two lines of electricity transmission and two substations

Origin	Final	U(kV)	Length (km)	Section (mm^2)	Capacity (MVA)
Los Guinchos	Valle	66	15.36	182	51
Los Guinchos	Mulato	15	17.85	116	44

Table 24 Lines of electricity transmission in La Palma

Substation	Type	U(kV)
Los Guinchos	C	66
Valle	C	66

Table 25 Substations in La Palma

The energy efficiency of fossil fuels conversion can be seen in the following table:

Energy products	Fuel oil	Diesel	Gasoline	LPG	Natural Gas	Coal	Subtotal
Electricity	-	37%	-	-	-	-	37%
Heat	-	-	-	-	-	-	-

Cold	-	-	-	-	-	-	-

Table 26 Energy efficiency of conversion (fossil fuels) in La Palma

The conversion of petroleum products to electricity reaches 37% for fuel oil and 15% for diesel oil.

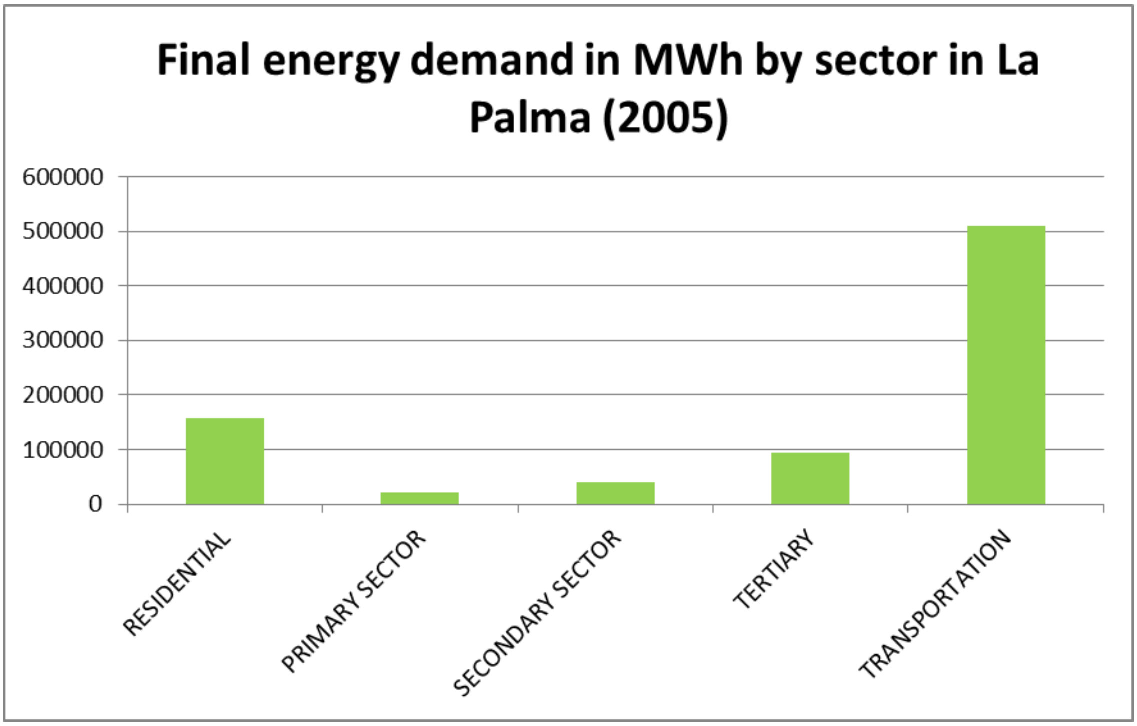
3.1.3. Final energy demand

In the absence of centralized services of heat or cold, in the study of final energy demand by sector only electricity demand is discussed. In the transport sector, following the breakdown by UNELCO-ENDESA according to CNAE, they are considered auxiliary electricity consumptions for operation and maintenance services of vehicles (garages, repair shops, etc). The fossil fuel emissions are the result of their use in each of these sectors.

As shown in the graph, the sector which demands more energy is transport which represents 62% of total final energy demand of the island. It is followed by residential at 19%, the tertiary sector (administration and services) with 12% and the secondary sector at 5%. Finally, the primary sector accounts for only a 3% of consumption.

Sector	Centralized power MWh	%	Fossil fuels MWh	%	Renewable energy sources	%	Total MWh	%
Residential	101,897	47.43	54,717	9.00	424	20.00	157,039	19.04
Primary sector	20,470	9.53	1,488	0.24	0	0.00	21,958	2.66
Secondary sector	6,089	2.83	34,990	5.76	0	0.00	41,079	4.98
Sector tertiary	84,836	39.49	8,650	1.42	1,698	80.00	95,184	11.54
Transportation	1,529	0.71	507,861	83.57	0	0.00	509,390	61.77
	214,822	**100.00**	**607,707**	**100.00**	**2,122**	**100.00**	**824,650**	**100.00**

Table 27 Final energy demand by sector in La Palma



Graph 9 Final energy demand in MWh by sectors in La Palma

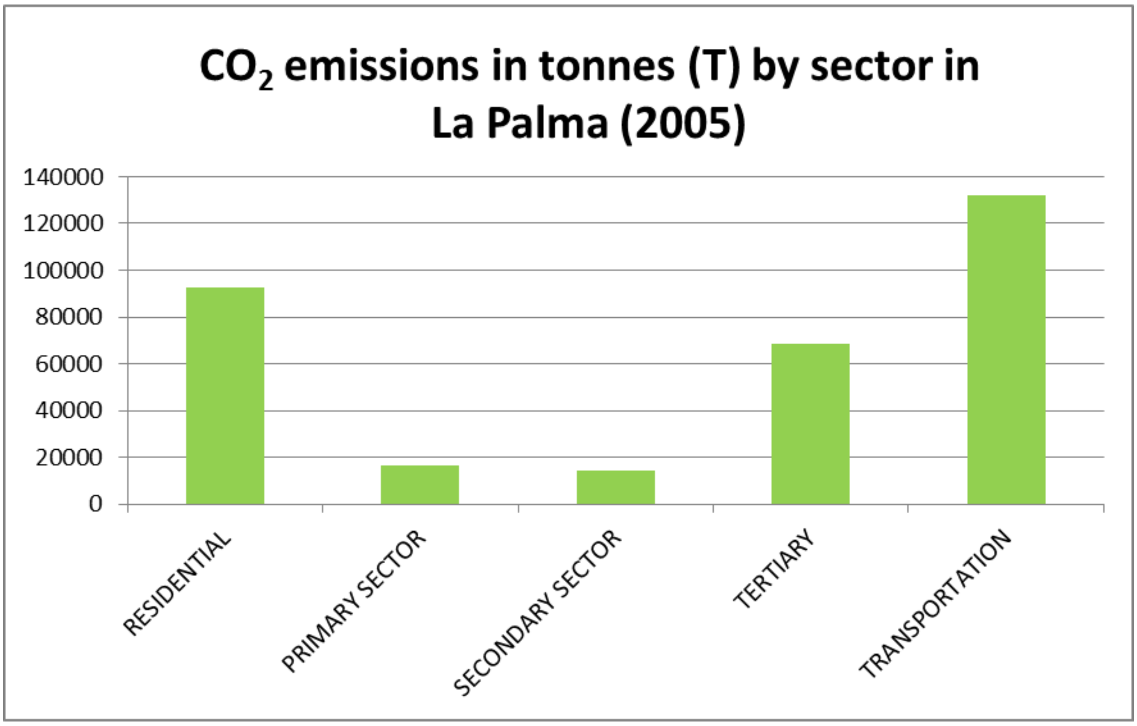
3.1.4. CO_2 emissions

Sector	Centralized power T CO_2	%	Fossil fuels T CO_2	%	Total T CO_2	%
Residential	79,331	47.43%	13,134	8.41%	92,465	28.59%
Primary sector	15,937	9.53%	397	0.25%	16,333	5.05%
Secondary sector	4,741	2.83%	9,359	5.99%	14,100	4.36%
Tertiary sector	66,048	39.49%	2,296	1.47%	68,344	21.13%
Transportation	1,190	0.71%	130,961	83.87%	132,152	40.86%
	167,247	**100.00%**	**156,148**	**100.00%**	**323,395**	**100.00%**

Table 28 CO_2 emissions by sector in La Palma

In the above table the centralized energy services make reference to emissions from the production of electricity for the end use of the different sectors concerned. In the transport sector the auxiliary electricity consumptions are considered for the operation and maintenance services of vehicles (garages, repair shops, etc). The fossil fuel emissions are the result of their use in each of these sectors.

CO_2 emissions are mainly produced in the transportation sector 41%, followed by residential one with 29% and the tertiary with 21%. The fuel that produces more emissions is the fuel oil and diesel fuel (diesel oil and diesel) used mainly for electricity production.



Graph 10 CO_2 emissions, in tonnes (T), by sector in La Palma

3.2. Projections 2020 – trend scenario

Having defined the energy situation in the reference year a trend analysis can be made with the real data that are available (until 2010) of the energy evolution until 2020. This is to analyze the progression of the energy evolution of the years between 2005 and 2010 and make an estimation based on the progression trend, of the following years till 2020. For this also it was taken into account the revised document PECAN 2006 and the Planning of electricity and gas sectors 2012-2020.

This section seeks to study the energy scenario of the island in 2020 following current and projected trends of consumption but without implementing activities that promote energy savings and efficiency, and greater penetration of renewable energy in the system.

3.2.1. Primary energy demand

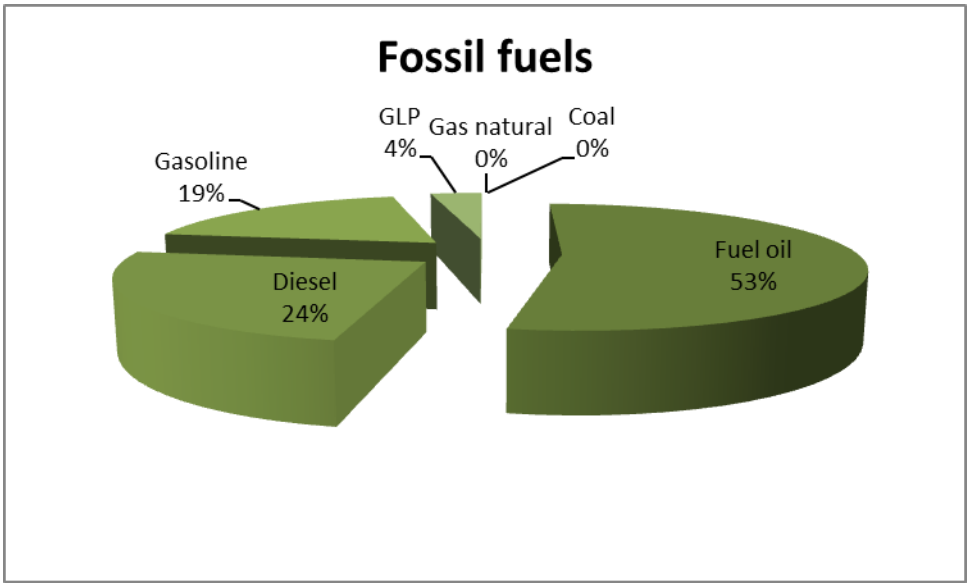
With the current progression of total primary energy demand it is estimated that in 2020, it will be of 1,369,539 MWh, having increased by 12.17% since the base year.

3.2.1.1. Fossil fuels

Both the diesel oil and diesel and fuel oil, will remain the fuels most used in the island, mainly used in electrical transformer. Gasoline will remain highly important in the transportation and LPG (liquefied petroleum gas), especially butane, in the residential sector.

Fossil fuel	MWh	%
Fuel oil	721,292	53.19%
Diesel	330,725	24.39%
Gasoline	257,127	18.96%
LPG	46,850	3.46%
Natural Gas	0	0.00%
Coal	0	0.00%
Subtotal	1,355,995	100.00%

Table 29 Fossil fuel needed in 2020 in La Palma



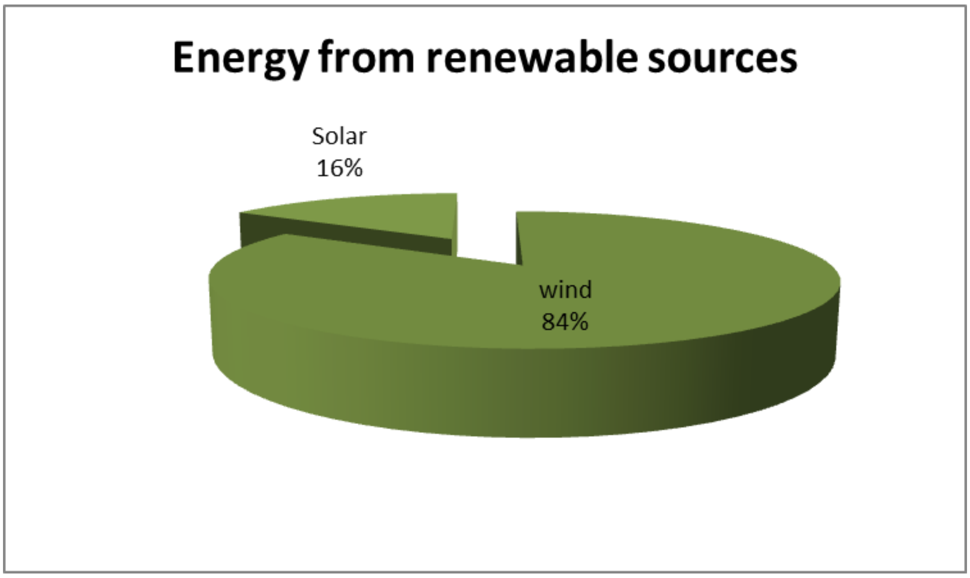
Graph 11 Fossil fuel needed in 2020 in La Palma

3.2.1.2. Renewable energies

The contribution of renewable energies remains practically the same as in the base year.

Renewable energy sources	MWh	%
Hydraulic	0	0.00%
Wind	11,415	84.28%
Solar	2,129	15.72%
Geothermal	0	0.00%
Marine	0	0.00%
Biomass	0	0.00%
Municipal waste	0	0.00%
Energy recovery	0	0.00%
Subtotal	13,544	100.00%

Table 30 Renewable energy produced in 2020 in La Palma



Graph 12 Energy production from renewable sources in 2020 La Palma

3.2.2. Production of secondary energy

The production of secondary energy and energy flows in La Palma are reflected in the following table:

Energy products	Fossil fuels MWh	%	Renewable energy sources (connected to public grid) MWh	%	Total MWh	%	Losses	%
Electricity	293,992	100.00%	11,422	100.00%	305,414	100.00%	30,541	10.00%
Heat	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cold	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	293,992	**100.00%**	**11,422**	**100.00%**	**305,414**	**100.00%**	**30,541**	**10.00%**

Table 31 Secondary energy production and energy flows in 2020 in La Palma

3.2.2.1. Description of the production systems

The primary energy is converted into secondary energy during 2020 is as follows:

Energy products	Fossil fuels MWh	%	Renewable energy sources (connected to public grid) MWh	%	Total MWh	%	Losses	%
Electricity	734,980	100.00%	11,422	100.00%	746,402	100.00%	440,988	59.08%
Heat	0	0.00%	0	0.00%	0	0.00%	0	0.00%
Cold	0	0.00%	0	0.00%	0	0.00%	0	0.00%
	734,980	**100.00%**	**11,422**	**100.00%**	**746,402**	**100.00%**	**440,988**	**59.08%**

Table 32 Primary energy converted into secondary energy in 2020 in La Palma

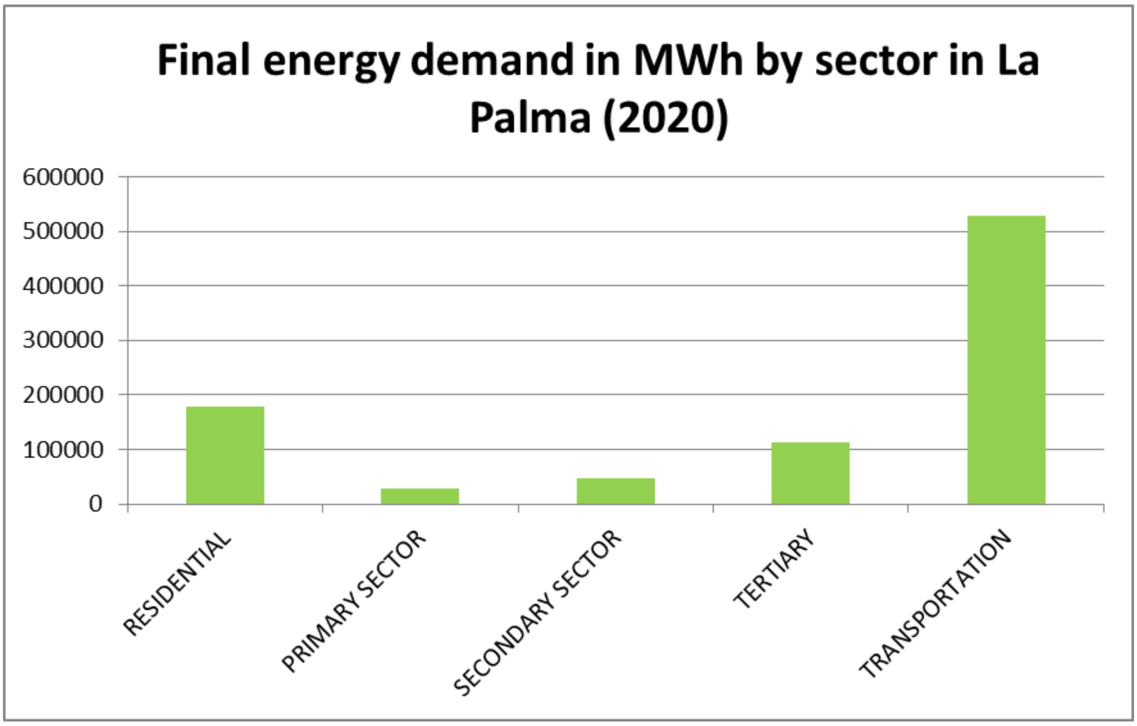
3.2.3. Final energy demand

In the 2020 scenario it is not expected to implement centralized services of heat or cold, so in the study of final energy demand by sectors it is analyzed only electricity demand. In the transport sector the electricity consumptions are considered to the operation and maintenance services of vehicles (garages, repair shops, etc). The fossil fuel emissions are due to their use in each of these sectors.

As shown in the table below, for the year 2020, the sector which more energy will demand is transport. This will imply a 59% of total energy demand, followed by the residential sector with 20% and the tertiary sector (administration and services) with 13%.

Sector	Centralized power MWh	%	Fossil fuels MWh	%	Renewable energy sources MWh	%	Total MWh	%
Residential	132,722	48.28	46,529	7.49	424	20.00	179,675	20.01
Primary sector	27,935	10.16	1,524	0.25	0	0.00	29,459	3.28
Secondary sector	10,333	3.76	36,316	5.85	0	0.00	46,650	5.19
Tertiary sector	102,354	37.24	8,809	1.42	1,698	80.00	112,860	12.57
Transportation	1,529	0.56	527,837	85.00	0	0.00	529,366	58.95
	274,872	**100.00**	**621,015**	**100.00**	**2,122**	**100.00**	**898,010**	**100,00**

Table 33 Final energy demand by sector in 2020 in La Palma



Graph 13 Final energy demand by sectors in 2020 in La Palma

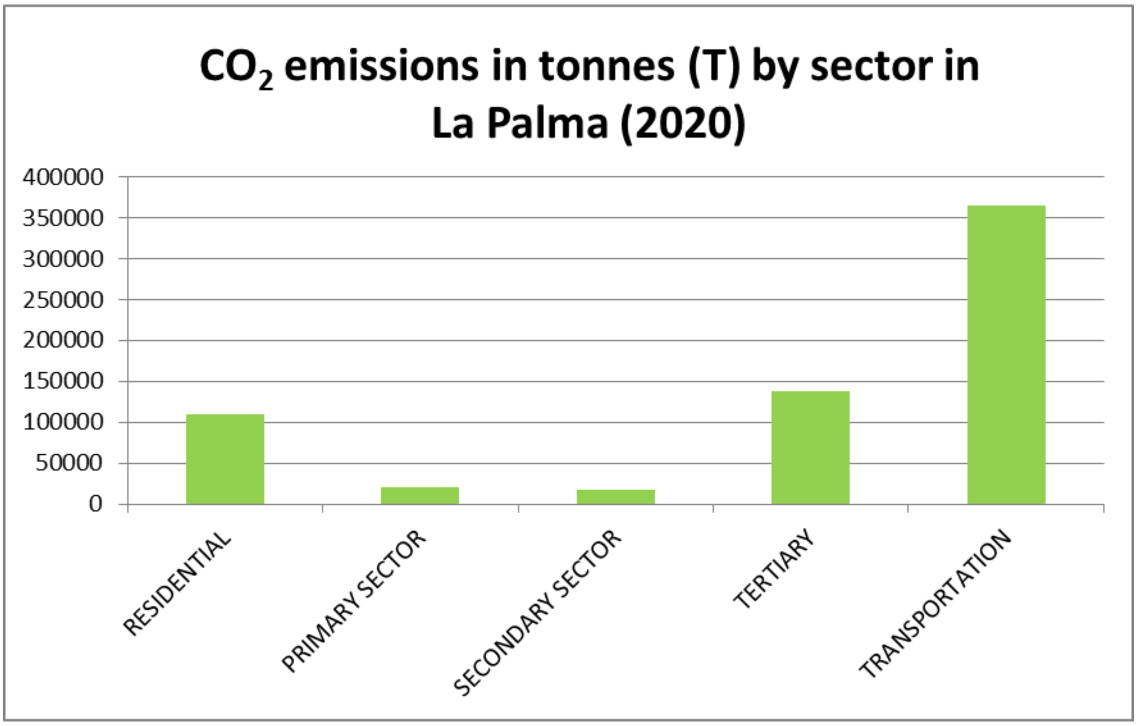
3.2.4. CO_2 emissions

Sector	Centralized power T CO_2	%	Fossil fuels T CO_2	%	Total T CO_2	%

Sector	Centralized power T CO_2	%	Fossil fuels T CO_2	%	Total T CO_2	%
Residential	98,921	29.67%	11,169	3.52%	110,090	16.91%
Primary sector	20,821	6.24%	406	0.13%	21,227	3.26%
Secondary sector	7,702	2.31%	9,719	3.06%	17,421	2.68%
Tertiary Sector	1,140	0.34%	136,308	42.93%	137,448	21.11%
Transportation	204,869	61.44%	159,944	50.37%	364,813	56.04%
	333,452	**100.00%**	**317,547**	**100.00%**	**650,999**	**100.00%**

Table 34 CO_2 emissions by sector in 2020 in La Palma

The breakdown presented in the table above, CO_2 emissions are produced primarily in the transportation sector 56%, followed by the tertiary 21% and 17% residential. For fuel, produces more emissions than the diesel (diesel oil and fuel oil) followed by fuel oil used for electricity production.



Graph 14 CO_2 emissions by sectors in 2020 in La Palma

The following tables summarize the expected changes from the base year (2005) until 2020.

Primary energy demand

Type of energy		2005 [MWh]	2020 [MWh]
Fossil fuels	Fuel oil	591,666	721,292
	Diesel	302,938	330,725
	Gasoline	257,891	257,127
	LPG	55,086	46,850
	Natural gas		
	Coal		
	Subtotal	1,207,581	1,355,995
Renewable energy sources	Hydraulic		
	Wind	11,190	11,415
	Solar	2,129	2,129
	Geothermal		
	Marine		
	Biomass		
	Municipal waste		
	Energy recovery		
	Subtotal	13,319	13,544
Total		**1,220,900**	**1,369,539**

Table 35 Forecasts of the primary energy demand in 2020 in La Palma

CO_2 emissions			
Type of energy		**2005 [T CO_2]**	**2020 [T CO_2]**
Fossil fuels	Fuel oil	165,075	201,241
	Diesel	80,885	88,304
	Gasoline	64,215	64,025
	LPG	13,221	11,244
	Natural gas		
	Coal		
	Subtotal	323,395	364,813
Renewable energy sources	Hydraulic		
	Wind		
	Solar		
	Geothermal		

CO_2 emissions			
Type of energy		**2005 [T CO_2]**	**2020 [T CO_2]**
	Marine		
	Biomass		
	Municipal waste		
	Energy recovery		
	Subtotal		
Total		**323,395**	**364,813**

Table 36 Forecasts of CO_2 emissions in 2020 in La Palma

Primary energy demand						
Year	**Fossil fuels [MWh]**	**Renewable energy sources [MWh]**	**Electricity [MWh]**	**Heat [MWh]**	**Cold [MWh]**	**Total [MWh]**
2005						
2005	1,207,581	13,319				1,220,900
2006	1,213,357	13,431				1,226,788
2007	1,259,747	13,544				1,273,291
2008	1,262,373	13,544				1,275,917
2009	1,229,144	13,544				1,242,688
2010	1,137,854	13,544				1,151,398
2011	1,196,406	13,544				1,209,950
2012	1,222,064	13,544				1,235,608
2013	1,247,520	13,544				1,261,064
2014	1,272,718	13,544				1,286,262
2015	1,289,458	13,544				1,303,002
2016	1,304,865	13,544				1,318,409
2017	1,312,305	13,544				1,325,849
2018	1,332,881	13,544				1,346,425
2019	1,341,173	13,544				1,354,717
2020	1,355,995	13,544				1,369,539

Table 37 Forecasts of the primary energy demand per year in La Palma

CO_2 emissions						
Year	**Fossil fuels [T CO_2]**	**Renewable energy sources [T CO_2]**	**Electricity [T CO_2]**	**Heat [T CO_2]**	**Cold [T CO_2]**	**Total [T CO_2]**
2005						
2005	82,999					82,999
2006	83,716					83,716
2007	85,140					85,140
2008	84,316					84,316
2009	82,042					82,042
2010	81,038					81,038
2011	86,117					86,117
2012	88,024					88,024
2013	90,543					90,543
2014	92,319					92,319
2015	93,898					93,898
2016	94,990					94,990
2017	95,481					95,481
2018	97,047					97,047
2019	97,644					97,644
2020	98,782					98,782

Table 38 Forecasts of the CO_2 emissions per year in La Palma

3.3. Projections 2020 – scene of the action plan

For the study of the projections in 2020 in the plan scenario, the PECAN data from 2006 and their later review, PECAN review 2006-2015 (January 2012) have been observed. It has also been taken into account the Planning of the electricity and gas sectors 2012-2020 (MITyC).

This section proposes actions that help to improve and increase energy efficiency and savings, and to increase the penetration of renewable energy in the system.

3.3.1. Primary energy demand

3.3.1.1. Fuel consumption growth

In the table shown in the following subsection we can see how to get a reduction in fossil fuel consumption by 21.1% in 2020 with the proposed actions.

3.3.1.2. Renewable energies

At present time there are about 5.88 MW from wind and 3.84 MW photovoltaic installed and it is intended to achieve 28MW from wind and 15.6 MW in photovoltaic farms. Other technologies are also introduced which does not currently exist on the island, such as biomass to produce biogas (2.70 MW) and increase small hydro capacity (7.74 MW).

Primary energy demand			
Type of energy		**2005 [MWh]**	**2020 [MWh]**
Fossil fuels	Fuel oil	591,668	351,235
	Diesel	302,938	316,562
	Gasoline	257,891	245,217
	LPG	55,086	40,221
	Natural Gas		
	Coal		
	Subtotal	*1,207,583*	*953,234*
Renewable energy sources	Hydraulic		12,271
	Wind	11,190	54,285
	Solar	2,129	29,229
	Biomass		27,000
	Subtotal	*13,319*	*122,784*
Total		**1,220,902**	**1,076,018**

Table 39 Primary energy demand in La Palma implementing the action plan

According to data obtained in this table, it is expected that 11.4% of primary energy comes from renewable sources by 2020. In 2005, the percentage was much lower, reaching only 1.1%.

3.3.2. Secondary energy production

3.3.2.1. Conventional power generation

As discussed in previous sections, the electricity demand of La Palma is covered mainly with fuel oil (98%) and diesel fuel from the Guinchos power plant located in Santa Cruz de La Palma, capital of the island, which has only diesel as generation motors technology. The island has currently an installed capacity of 105MW.

The actions that have been introduced to reduce CO_2 emissions and increase the penetration of renewable energy in electricity production consist, as discussed above, in improving the efficiencies of generation units by replacing the most obsolete and inefficient by others working in higher output, or by the placement of new groups, so as to pass from an efficiency of 40% to 52% in 2020. On the other hand it is also recommended to improve the transmission and distribution grid in order to reduce the losses that occur today. With respect to renewable energies, an increase in renewable sources in electricity system is proposed. In this sense it provides a significant rise in wind energy and photovoltaic mainly.

At present time there are about 5.88 MW from wind and 3.84 MW photovoltaic installed and it is intended to achieve 28MW from wind and 15.6 MW in photovoltaic farms. Other technologies are also introduced which does not currently exist on the island, such as biomass to produce biogas (2.70 MW) and increase small hydro capacity (7.74 MW).

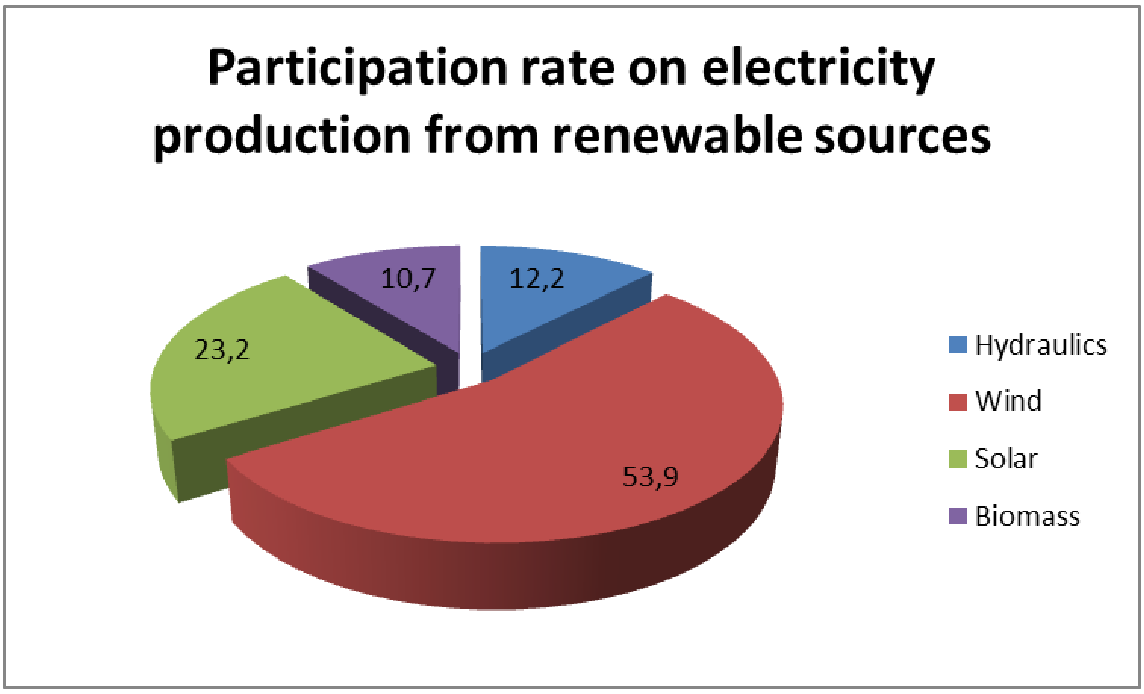
The results obtained for the year 2020, using the model-PACT ISLE project are as follows:

Secondary energy production and flows of energy					
Type of energy		**Electricity [MWh]**	**Heat [MWh]**	**Cold [MWh]**	**Total [MWh]**
Fossil fuels	Fuel oil	181,553			181,553
	Diesel	6,335			6,335
	Total partial	*187,888*			*187,888*
Renewable energy	Hydraulic	12,217			12,271
	Wind	54,285			54,285
	Solar	23,400			23,400
	Biomass	10,800			10,800
	Energy recovery				
	Total partial	*100,755*			*100,755*
Subtotal		288,643			288,643
Total		**288,643**			**288,643**
Distribution losses and self use					23,091

Table 40. Secondary energy production and energy flows in 2020 in La Palma, applying the action plan

The greatest contribution of renewable energy for electricity production comes from wind, followed by photovoltaic.

In turn, the distribution of renewable energy production in the various technologies is as follows:



Graph 15 Participation rate on electricity production from renewable sources

Under the proposed hypotheses and the results obtained along this section, it can be concluded that the stronger energy commitment for 2020 is to adapt the electrical system, by increasing the installed power capacity and providing it with smaller unitary equipment, flexible and rapid-response coupling for high wind penetration.

As shown in the chart above, the greatest contribution of renewable energy corresponds to the wind with an installed capacity of 28 MW followed by 15.6 MW of photovoltaic

In favour of wind power it must be said that, despite being highly variable and intermittent, systems and more reliable models of wind forecast are increasingly being developed which reduces forecast errors of wind energy production but does not eliminate them, so this kind of energy is still being very little managed.

3.3.3. Final energy demand

3.3.3.1. Electricity consumption growth

A moderation in the growth of final energy consumption in the next decade is envisaged in the residential sector due to the small expected increase in the number of households. However, it is expected to continue the growth of household energy consumption, especially electricity, as given that the electrical appliances and air conditioning equipment still have growth potential, reaching the saturation only at the end of the projection period. Efficiency measures will continue to encourage the replacement of domestic equipment with more efficient ones.

The services sector will maintain its growth both in activity and energy consumption. Its energy intensity will fall less than other economic sectors, given that the greatest increase in activity will come from significantly sub-intensive sub sectors in power consumption, especially those related to information technology and telecommunications. It is, therefore, in this sector where it is detected a greater potential for efficiency improvement in the electrical equipment in offices (office computerization and air conditioning) and other buildings of the tertiary sector (hotels, hospitals, etc...).

Final energy consumption in the industry will decline slightly throughout the foreseen period due to the stabilization of production capacity in the sectors of more intensive energy consumption and continuous improvement of efficiency that comes from the introduction of new technologies. The energy price scenario favours this improvement in order to maintain competitiveness.

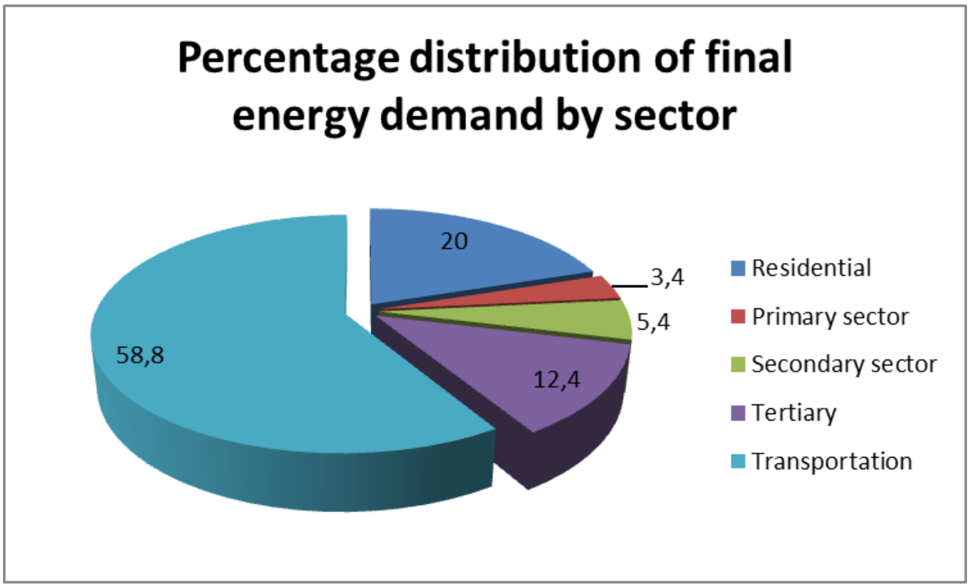
The data obtained in the final energy demand are:

Final energy demand							**2020**
Type of energy		**Residential [MWh]**	**Primary sector [MWh]**	**Secondary Sector [MWh]**	**Tertiary Sector [MWh]**	**Transportation [MWh]**	**Total [MWh]**
Centralized power	Electricity from public network	128,718	27,935	10,333	96,855	1,710	265,551
	Subtotal	*128,718*	*27,935*	*10,333*	*96,855*	*1,710*	*265,551*
Fossil fuels	Fuel oil		2	2,057	36		2,095
	Diesel	78	1,500	34,164	8,138	260,500	304,379
	Gasoline		23	96	122	244,976	245,217
	LPG	42,607			-2,386		40,221
	Natural gas						
	Coal						
	Subtotal	*42,685*	*1,526*	*36,316*	*5,910*	*505,475*	*591,912*

Final energy demand							**2020**
Type of energy		**Residential [MWh]**	**Primary sector [MWh]**	**Secondary Sector [MWh]**	**Tertiary Sector [MWh]**	**Transportation [MWh]**	**Total [MWh]**
Renewable energy sources (excluding electricity and heat sold to public grid)	Hydraulic						
	Wind						
	Solar	1,438			4,391		5,829
	Geothermal						
	Marine						
	Biomass						
	Subtotal	*1,438*			*4,391*		*5,829*
Total		**172,841**	**29,461**	**46,650**	**107,156**	**507,185**	**863,292**

Table 41. Final energy demand

In the above table, it can be seen how the transport sector is the most demanding of energy followed by residential. In this case, the tertiary sector is not as important as in the capital and in eastern islands. This is the third smallest island of the archipelago, where the hotel capacity, utilities, etc does not represent a great consumption for the island. La Palma, like El Hierro and La Gomera, has not suffered an aggressive exploitation for tourism purposes as the latter. For this reason, in these islands, services sector has less influence than residential.



Graph 16 Percentage distribution of final energy demand by sector

3.3.4. CO_2 emissions

The actions that have been introduced to reduce CO_2 emissions consist, as discussed above, in improving the efficiencies of generated units by replacing the obsolete and inefficient ones by others working in higher output, or by placing of new units, the way that efficiency of 40% will increase to 52% in 2020. On the other hand, it is also recommended to improve the transmission and distribution grid in order to reduce the losses that occur today. With respect to renewable energies, it is proposed an increase renewable source in electricity system. In this sense it will provide a significant increase mainly in wind energy and photovoltaic.

At present time there are about 5.88 MW from wind and 3.84 MW photovoltaic installed and it is intended to achieve 28MW from wind and 15.6 MW in photovoltaic farms. Other technologies are also introduced which does not currently exist on the island, such as biomass to produce biogas (2.70 MW) and increase small hydro capacity (7.74 MW).

Thus, taking into account all the actions the emission reductions of 27% is achieved, compared to 2005. Most beneficial actions of these decreases are, firstly the improvement of the efficiency of conventional units and, secondly, the high penetration of wind energy.

Year	Total CO_2 emissions (tonnes)	CO_2 emissions reduction compared to 2005
2005	323,395	0%
2005	323,395	0%
2006	322,680	0%
2007	334,667	-3%
2008	335,659	-4%
2009	326,666	-1%
2010	299,397	7%
2011	311,156	4%
2012	309,324	4%
2013	302,218	7%
2014	267,001	17%
2015	253,139	22%
2016	253,851	22%
2017	252,931	22%
2018	254,732	21%
2019	253,675	22%

Year	Total CO_2 emissions (tonnes)	CO_2 emissions reduction compared to 2005
2020	253,228	22%

Table 42. CO_2 emissions reduction

In this case, over 20% of minimum emission reductions to be achieved.

4. ACTIONS

Regardless the actions that will be proposed next on the island they have been carried out through its institutions, stressing at this point the work of the Island Local Government of La Palma, actions aimed at saving and preserving the natural beauty of the island.

Among the actions which are intended to be undertaken in the short term to promote clean energy in order to reduce emissions in power generation we can highlight the improvement of Fuencaliente and Garafía wind farms, which aims to replace the turbines available by more efficient than triple the power.

Other actions aimed at promoting clean energy are the study to implement hydroelectric pumping stations in the municipalities of Barlovento, Puntagrande, Tijarafe and/or Fuencaliente.

As for the actions in the water sector, the strengthening of the grid in the west area of the island to avoid losses and the improvement of the transmission grid to Valle de Aridane, among others have to be highlighted.

In the public sector, the Island Local Government of La Palma is conducting energy audits in all buildings and facilities it owns and it is proceeding to review the billing, to promote efficiency and energy savings in demand.

In this sense, as far as public lighting is concerned, LED lighting is to be used for tunnels in the island thus greatly reducing their current consumption.

In the transport sector, the promotion of electric vehicles for this purpose is being working out the corporation has purchased a hybrid car and plans to buy an electric vehicle, to serve as example.

The actions detailed below, will promote and encourage Canary Islands Government, the Island Local Government of La Palma and Local Administration, each one of them according to its competence in each of the actions that are mentioned.

4.1. Primary energy demand

4.1.1. Transportation

The transport sector has an extraordinary importance both for the high volume of its emissions and by the strong growth they experienced, therefore, and it has been a subject to measures and specific programmes to promote a more efficient transport system that preserves the environment and non-renewable resources. Because of this, and the estimated changes in population, it is expected to moderate the growth of energy demand for transport.

Moreover, road transport will remain to be the way of transport of higher growth. In the next decade it is expected that the number of cars will be slightly increasing till reaching the population relative values similar to those of European countries with higher income.

The specific consumption of new vehicles would be reduced as a result of technological improvements, partly forced by specifications of environmental protection and the development of electric vehicles or biofuels. In addition, energy consumption in the transport sector will be reduced by the enhancement of ways of transport alternative to private vehicle in order to absorb the demand for mobility.

4.1.1.1. Public transport

Among all the actions that can be applied in the transport sector, the promotion of public transport is one of the most important action due to its strong and immediate impact on reducing fuel consumption and therefore reduce emissions.

To encourage the use of public transport several additional steps are required to enable an improvement in the quality, availability and reliability of this type of transport. Some of the measures to be applied to this area of activity are:

- **Priority public transport road.** To establish on urban roads the criteria of public transport priority over private. This may lead to create exclusive lanes or routes for public transport and traffic lights priority or any other measure in this regard (in city centres self-taxis are considered to be included in these measures).
- **Interchanges and parking.** Enhancing transport interchanges, combined with park and ride. In this line, it could be considered the sharing of these car parks in shopping centres already established in the outskirts of big cities and have plenty of space reserved for them.
- **Rates, correspondence and efficiency.** It will create new pricing structures and access verification elements, such as island and local fertilizers or magnetic or optical readers to support the use of public transport, to facilitate correspondence between urban and interurban lines or between different lines within the same lines and that will reduce drastically the detention time at stops.
- **Vehicle Tracking Systems.** Incorporation of monitoring systems in public service vehicles to improve information to the user about waiting times and optimize fleet management.

At present time, the company *Transportes Insular La Palma* which manages the public transport throughout the island, has 18 lines that cover the island territory.

The importance of using public transport to achieve the goal of reducing fuel consumption is such that whereas only 1% of drivers in La Palma stop using their private car to become commuters, annual savings of 3,875 MWh, would be achieved, representing approximately 0.7% of total annual consumption of land transport on the island in the base year 2005

It is estimated that an annual 3% of drivers will start using public transport which will help to achieve total cumulative savings of 104,613 MWh in the period 2012-2020 and a reduction in CO_2 emissions of 3,285 Tm compared to base year.

4.1.1.2. Electric vehicle

The introduction of electric vehicles on a significant scale only makes sense if their needs in energy recharging are met by renewable energy.

Given the high penetration of wind energy planned for the Canaries, electric vehicles can play a key role to avoid disconnection of wind farms in hours "valley" for the excess peak of energy they produce and pour into the grid. This utility electric vehicle as regulator of the electrical system would help to accelerate the development of renewable energies in the Canary Islands, given the size and strong involvement of road transport in final energy consumption on the Islands.

To this end, a special action will be developed and promoted, that will include quantified objectives and financial support for the purchase of electric vehicles, reinforced with a unique initiative for the implementation of recharging points linked to renewable energy.

The electric vehicle is the alternative for the future in terms of urban transport as it brings a considerable reduction of energy consumption, and most importantly, a reduction in environmental pollution in big cities. The islands are an ideal place for the deployment of these vehicles, given the short distances to travel.

In this regard, it is expected that the island of La Palma will count in the near future with the first electric vehicle to 'rent a car' purposes of the Canaries.

Annually the Canary Islands Government makes a campaign for subsidies, called Plan Renove, to purchase vehicles powered by alternative energy. The aim of these campaigns is to encourage that the substitution of the vehicles should be made by other ones much more energetically efficient than most of the vehicles on the road. To exploit these advantages of lower consumption of modern vehicles, it will boost the renewal of the vehicle fleet through support to the acquisition of more efficient vehicles, including electric propulsion, hybrid, fuel cell, etc. These subsidies will reduce the extra initial purchase cost.

Nationally there is also an Action Plan 2010-2012, which is a part of the Comprehensive Strategy to Promote Electric Vehicle in Spain 2010-2014, called Plan MOVELE. This plan consists of a number of measures to be implemented over the coming years to encourage decisively the introduction of electric vehicles. These measures are referred within four basic areas defined by the Strategy: to promote the demand for these vehicles, support industrialization of and R&D this technology, facilitate the adjustment of the electrical infrastructure for proper recharging and demand management, and enhance a number of transversal programmes related to information, communication, training and standardization of these technologies.

However the acquisition of vehicles powered by alternative energy do not increase at a pace that would be desirable in the archipelago, with sales figures for hybrid and electric vehicles in 2011 in the Canary Islands around 300 units.

However according to forecasts by the International Energy Agency it is expected that from 2013 sales of gasoline hybrid vehicles will increase to 7% of sales in that year, with the purpose of increasing the sales of gasoline plug-in hybrids in 2014 and of diesel hybrids and electric ones in 2016 and 2017 respectively.

According to the International Energy Agency in 2020 it is expected that approximately 14% of sales will be gasoline hybrid vehicles, 5% fuel plug-in hybrid vehicles, hybrid vehicles 4% and 2% diesel electric vehicles.

In Spain in the National Action Plan for Renewable Energy of Spain (PANER) 2011 - 2020, in the fleet renewal measures it is included the goal of achieving by 2020 a 10% of the national park of these vehicles. It is expected that the energy savings will follow the next patterns: conventional hybrids could save 20-25% of the average annual energy consumption, while plug-in hybrids would be at 35-40%, estimating the cost savings associated with pure electric vehicles the environment of 50-55%.

As mentioned above, the forecast of fleet in La Palma in 2020 is as follows:

La Palma fleet forecast year 2020	
Gasoline vehicles	51,664
Gas oil vehicles	29,338
Gasoline hybrid vehicles	6,052
Gas oil hybrid vehicles	937
Gasoline hybrid plug vehicles	1,460
Electric vehicles	550
Total	**90,002**

Table 43 La Palma fleet forecast year 2020

Estimated savings in 2020 of 29,519 MWh, which represent approximately 6% of total annual consumption of land transport in La Palma in the base year 2005 and a reduction in CO_2 emissions compared to base year of 1,364 Tm, due to the new composition of the fleet, with the prominent presence of conventional hybrids, plug-in hybrids and pure electric vehicles.

4.1.1.3. Biofuels

In the Canary Islands there is a problem regarding the introduction of biofuels, due to lack of infrastructures, and the extra costs off the prices of the Peninsula, in addition to storage costs and logistical investment required in the Canary Islands.

Therefore, in order to meet annual targets for biofuels minimum **established by the Royal Decree 459/2011, of 1st April** for transport purpose setting regulations to raise consumption by **6.4%, 6.5% and 6.5%, in 2011, 2012 and 2013 respectively;** the competent advice on energy will suggest to the Ministry of Industry, Tourism and Trade, the adoption of the exceptions or flexibilities for the Canaries as deemed necessary regarding the general mechanism of promoting the use of biofuels.

With an eye on the horizon of 2020, the **Directive 2009/28/EC of the European Parliament and the Council of 23rd April 2009** on the promotion of the use of energy from renewable sources, it is established that each Member State shall ensure that the share of energy from renewable sources in all types of transport in 2020 is at least **10%** of final energy consumption in transport, so this value could be set as a minimum annual target of selling or consumption of biofuels for transport purposes for that year.

The table below shows the forecast consumption of biofuels for transport in La Palma in the period 2012-2020:

Year	Biofuels for transport (MWh)	Annual rate of change (%)
2012	28,311	4.9
2013	28,439	0.5
2014	29,519	3.8
2015	31,097	5.3
2016	32,745	5.3
2017	33,040	0.9
2018	34,428	4.2
2019	36,390	5.7
2020	38,464	5.7

Table 44 Forecast of consumption of biofuels for transport in La Palma 2012-2020

Based on the above and following the trend of the forecast consumption of biofuels for transport purposes of the revised PECAN 2006-2015, shown in the table above, it is estimated that the savings in the transport sector of the island of La Palma will be 20,470 MWh in the period 2012-2020 and a reduction in CO_2 emissions compared to the base year of 810 Tm, considering fossil energy savings of 7% in the consumption of biofuels versus conventional fuels.

4.1.1.4. Awareness campaigns

Among the initiatives that can have a major impact, both in short and long term there are those responsible for developing, through 2020, annual specific campaigns of information and awareness for citizens in general, on alternatives to car use (walking, cycling, bus, private car sharing) and to promote citizen initiatives regarding bicycle and pedestrian mobility, such as the commitments and agreements on the use of bicycles, European week of mobility, weeks without cars, and others.

Among the actions that already have been fulfilled it stands out efficient driving courses for professionals in the transportation of persons and goods, for employees of public administration and drivers in general, interested in obtaining savings in both CO_2 emissions and in fuel.

The driving courses allow fuel savings of between 15% and 20% without reducing the average speed. Besides the cost savings, that this entails, they also have important environmental benefits, significantly reducing emissions of greenhouse gases: 50% less CO_2, 78% less carbon monoxide and 50% less nitrogen oxide.

These measures also help reduce noise pollution and the costs of vehicle maintenance (brakes, clutch, gearbox and motor), while raising safety and comfort of drivers.

On the island of La Palma it is suggested that at least 800 drivers will make driving courses between 2012 and 2020, from which are expected to be about 600 car drivers and 200 drivers of commercial vehicles (buses and trucks). This action will produce energy savings of approximately 1,152 MWh, and a reduction in CO_2 emissions compared to base year of 36 Tm.

As for the courses for employees of public administrations, it is estimated that approximately 2,700 employees with driving license of Government of Canary Islands, of the Island Local Government of La Palma and municipalities, have conducted courses in 2020. This will result in energy savings of approximately 3,856 MWh, and a reduction in CO_2 emissions compared to base year of 121 Tm.

4.1.2. Actions to increase renewable energy contribution

4.1.2.1. Wind energy

The development of technologies for exploiting renewable energy, especially wind power technology, has been dramatic in both technical potential and through a substantial reduction in costs that approach the threshold of competitiveness with conventional generation sources.

The PECAN provides for the La Palma 28 MW of wind power by 2015, power that will be hardly installed in the fixed time limits, as ending the year 2011, there are only 6MW installed although there are 7MW approved for their next installation, possibly scheduled for the next two years, once all pending administrative proceedings have been completed. In an optimistic outlook for 2020 it is possible to reach the proposed 28MW by PECAN which would be a energy production of about 54,040 MWh per year.

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Offshore wind energy (marine) is another very attractive field of action. At sea, the wind has a very low surface roughness and without obstacles, which implies that wind speed does not undergo major changes. Moreover, the wind is less turbulent than on land, which, on one hand, will obtain a more stable production of electricity and 20% higher than the wind *onshore* (ground) and, on the other hand, it will enlarge the time period of wind turbine useful work.

The main problem for its implementation lies in the fact that it should be installed in shallow water, a circumstance not common on our coast. It also requires a significant financial investment
However, this kind of energy is experiencing strong support from international private investors that could give satisfactory results in the medium term. In the Canary Islands, the offshore wind potential is attracting researchers and companies who want to initiate innovative projects in the Canaries. It should ensure its development through support to experimental and unique projects.

Another action to consider, and that should be encouraged from the public administration, is to promote installations with small wind power[4] (less than or equal to 100 kW) associated with consumption centres interconnected to the grid, especially at low voltage, thus allowing the integration of renewable generation without need for new electricity infrastructures, and also encouraging further public participation improving energy efficiency and fighting against climate change. It also seeks to increase the system stability, by promoting the distribution of generation all over the island and involving consumers in the energy management to make them small producers through these small facilities.

4.1.2.2. Solar energy

4.1.2.2.1 Solar photovoltaic

Given that the objectives that were established by PECAN in respect of involving solar photovoltaic were to reach the figure of 160 MW installed in the Canary Islands in 2015, to meet this forecast it should have had 92.50 MW installed in 2009.

At the end of 2009 the real power installed in the Canary Islands was almost 100 MW, which is above expectations, and therefore, it is expected that by the end of 2015 it will reach an installed capacity of 238MW, almost 50% more MW of the 160 originally planned.

However, it should continue promoting the installation of photovoltaic panels in the Canaries and therefore keep generating facilities for their installation. Therefore, to support the installation of solar photovoltaic applications isolated from the power supply in order to provide electricity to consumption points being away from the grid.

[4] Royal Decree 1699/2011, November 18, by regulating the network connection of production facilities of small power electrical energy.

Also, it will make easier the implementation of solar photovoltaic connected to the grid, being compatible with maintaining the quality of electric service and environmental protection. In this regard, the rules to limit or make easier the implementation of these facilities could be issued, either in terms of size, from the point of connection to the grid or by criteria related to the occupation of land.

The provisions that could be used to promote of these installation shall be conditioned on the expected profitability of them, considering the amount of the premium that at any time could be set by the State to encourage the production of electricity through photovoltaic panels.

Also it should be considered, as well as for wind energy, the promotion of installations with photovoltaic building small power (less than or equal to 100 kW) whose regulation is included in the Royal Decree 1699/2011 and from which the requirements have been simplified for small power plants that can be connected to the points where there is already a supply. This Royal Decree will promote the development of distributed generation that provides benefits to the system such as reduction of losses in the grid, lower investment needs in new grids and, ultimately, a minimization of the impact of electrical installations in their surroundings.

For La Palma, the revision of PECAN is expected that photovoltaic capacity reaches 8 MW in the horizon of 2015 (in 2010, this power was about 2 MW, somewhat less than PECAN expected for that year, 3.84 MW). Given this situation, and if the actions mentioned above are fulfilled and promoted, it would be expected that 15.5 MW to be reached by 2020. This power would mean a production of about 23,400 MWh of energy per year.

4.1.2.2.2 Solar Thermal Energy

Given the contribution to energy savings and energy efficiency, it will be considered the implementation of a plan to revitalize support for the installation of solar panels for domestic hot water and other applications, using agile and effective economic instruments.

It will ensure that the new building rules are fulfilled the installation of solar panels on new buildings, thus, to meet the objectives proposed.

It will also assess the possibility of using regulation instruments that can establish compulsory schedules for the implementation of flat solar panels linked to certain economic activities.

Likewise, it will ensure that Local Authorities require the installation of solar panels in the restoring projects of residential buildings or existing accommodation plant, while it is not legally compulsory in the new Technical Building Code.

At the end 2009, the installed surface of solar panels in Canaries reached approximately 123,000 m^2, compared to 175,000 m^2 estimated by the PECAN, which is 30% less than expected.

Of these, 3,169 m^2 are installed in La Palma, which is equivalent to a thermal capacity of approximately 2,218 kWt. If the forecasts and prior actions in 2020 could reach about 6,200 m^2 (4,340 kWt) this would prevent emissions of 1,983 Tm of CO_2. The installation of solar collectors is mainly divided between the tertiary sector with 70% and 30% residential.

4.1.2.2.3 Thermal energy

Canary Islands have a significant potential for solar energy. The possible application of this technology in Canaries goes through small installations with a power limit of 10 MWe and an occupation of land of 1 ha/MW, particularly for seawater desalination, an energy-intensive activity with an widespread use Canary Islands, using waste heat from solar plants.

Based on this, it will favour in making an inventory-survey of the solar potential resources in order to avoid problems of quality and development in solar thermal energy in the Canaries. At the same time, the policy changes needed to enable this technology a logical evolution in terms of resources, the state of technology and social interest in the development of solar energy will be analyzed.

4.1.2.3. Forest and agricultural biomass

The competent Department for energy will favour the development and dissemination of specific studies of potential generation using this technology, especially for thermal domestic hot water (DHW) and air conditioning (cold and heat). There will be particular interest in heavy users of such energy, such as hotels and public buildings (hospitals, schools, etc). It will also seek proper dissemination of the measures taken and the applications in order to set an example and encourage the use of such technology. Finally, it will seek to improve the conditions of access to credit and ease of application of formulas such as leasing for installations that use biomass.

4.1.2.4. Wave energy

IDEA places the Canary Islands as one of the best locations for harnessing this energy source for the high persistence of the annual appeal and the low frequency of extreme storms. Since this technology has been under development and it is not expected in the short terms that it may be brought into the market, there will be monitoring of their progress, proceeding, where appropriate, to establish measures of support to business and technology development, and making easier their integration into power grids for experimental purposes.

Although it is difficult to predict the evolution of these technologies, in the world there is a growing interest in developing commercial equipment after many years of research and development. Contacts are being made internationally to attract companies to the Canaries. That is why it is expected that by 2020 the pre-commercial equipments would be installed in the areas of trials or associated to facilities that demand a high energy intake and which are situated near the coast, for example desalination plants of seawater.

4.1.2.5. Geothermal energy

Canary Islands have a significant geothermal potential, which is being investigated in the light of new geochemical and geophysics prospecting techniques applied in active volcanic zones that allow to define the hidden hydrothermal systems in the basement of the island. It is also a manageable power, and therefore, geothermal energy can contribute significantly to the so-called "renewable mix" bringing stability to the grid.

Therefore, it should make easier the studies which are necessary to determine the potential of generation of this technology and its possible application.

The conditions for the existence of high temperature geothermal resources related to magmatic events, the geothermal of high conventional enthalpy only occur in Spain, in the Canary Islands.

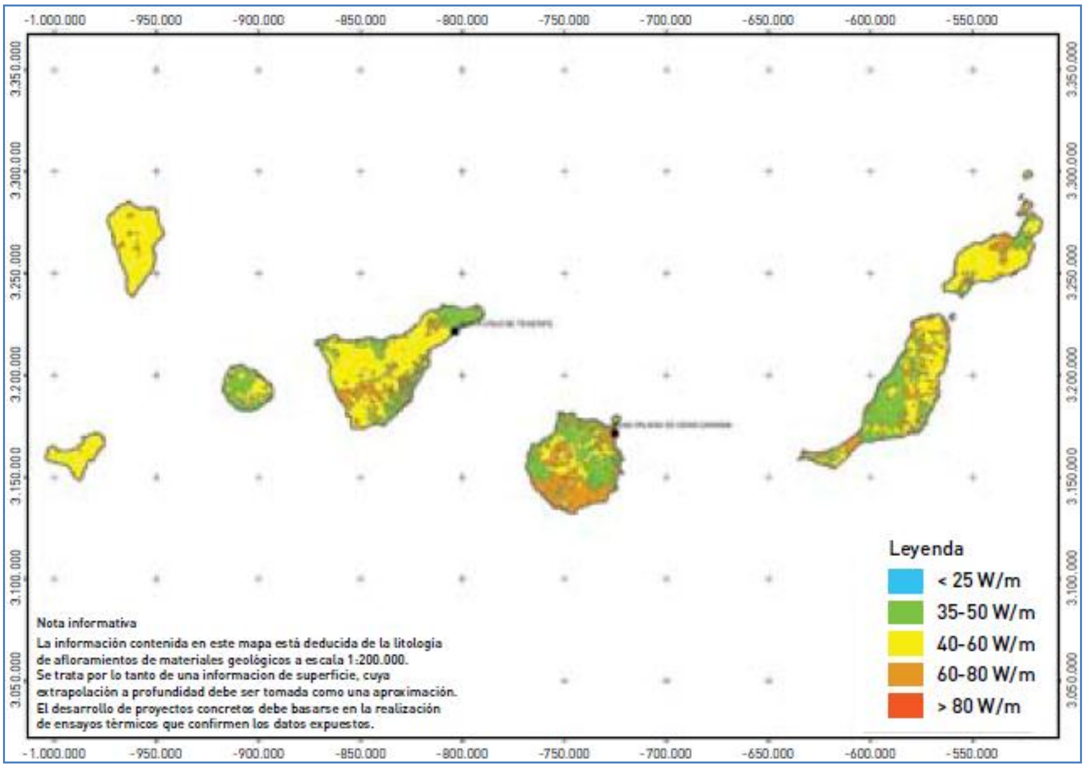

Figure 6 Surface thermal map of Canary Islands
Source: IDAE

4.1.2.6. Small hydro power

Currently there are two mini-hydro plants installed in the Canary Islands, one in Tenerife and another one in La Palma, with a total capacity of 1.26 MW.

On the island of La Palma the plant of El Mulato is located which is the first plant of its kind in the Canary Islands, with an installed capacity of 800 kW. However, since 2005 it is inoperative and is expected to upgrading (currently in draft form) to reach a total capacity of 5,400 kW in 2015.

In addition to the upgrading of the central Mulato, small hydro capacity of La Palma will be increased by the addition of new breaks so that 7.74 MW can be achieved by 2020, thus implying an energy output of about 12,270 MWh per year.

4.1.2.7. Biogas

Apart from energy from renewable sources mentioned in the preceding paragraphs, the PECAN also contemplates the biogas produced from both landfills and waste water in sewage sludge through. In this sense, the forecast for La Palma is to reach an installed power of 1MW in 2015 that can reach at about 2.70 MW by 2020 implying an annual energy production of about 10,800MWh.

4.2. Production of secondary energy

4.2.1. Proposals for conventional power

At present, the low penetration of renewable energy in the electrical system of La Palma is not a problem for the management and stability of conventional electricity generation. However the fact of significant increase of the penetration of renewable energies, mainly wind power, raises questions of power system stability. This implies that the operator of the system needs more spinning reserve and power generation capacity to ensure the system's stability with a high penetration of renewable energies.

In small and isolated electrical systems, as in the case of Canaries it is important to limit the maximum size of the generation units. This size limitation is determined by the fact, that in an isolated system, the excessively big size of the generation unit decreases the reliability of the electrical system. Moreover, from the point of view of renewable energy integration it is better to have modular and flexible conventional power generation units.

It is estimated for La Palma a maximum size of 8 MW for conventional generation units of the electrical system of the island. (Source: "Planning for the electricity and gas. 2012-2020"). These values are based on the results of studies made by the system operator, which combine probability analysis of coverage with analysis of actual incidents that cause significant losses of generation and sometimes actions of load shedding mechanisms for excessive variation of frequency.

In La Palma the need for further action to meet demand in the planning horizon has not been detected, being enough the actions included in the planning 2005-2011. These actions consist in transforming the line connecting the centre of Los Guinchos with central El Mulato to 66 kV, double line of 66 kV Guinchos-Valley and the creation of a new double circuit 66 kV to facilitate the evacuation of wind generation in Fuencaliente the new substation in the south of the island. Moreover and in order to improve the distribution grid a change of meshing is proposed, with the inclusion of the 66kV new substation of Tajuya. It also raises the need for a new 66kV double circuit Guinchos-Mulato, in case that the requested pumping Mulato is carried out.

Furthermore, under the considered hypothesis of demand evolution, the availability of any additional to the currently installed on the island would not be necessary.

In "The Canary Strategy of Fighting against Climate Change" prepared by the Canary Agency for Sustainable Development and Climate Change it is established as a goal the improvement of generation units´ yield in electricity production. It could increase by 1% of the total yield, calculating the ratio between final energy produced and used as a primary energy input of the generation between 2010 and 2015. The responsibility lies with supply companies, although the administration shall act through emission permits by application of the Directive on Integrated Prevention and Control of Pollution. This initiative is promoted the same as two previous performances, partially by the Regulations on Emission Trading. This measure is not specifically provided in PECAN 2006, but it is compatible with it. It will suppose the emissions of greenhouse gases savings of 400 Gg in 2015. These are the business-like measures, even though it could be influenced through integrated environmental permits.

4.2.2. Energy storage

One of the greatest difficulties for the penetration of renewable energies in the Canaries is the need for immediate response to the unscheduled shutdown of power generation facilities from this type of energy, mainly solar and wind power. The incorporation of energy storage systems such as installation of the load curve regulation, transferring energy from the overrun moments into the ones of lack will allow the energies of random generation (like wind or solar), to compete with programmable energy (as heat).

The installation of a storage plant with reversible pumped hydro system is a real option to store energy in significant quantities for island electrical systems, whereby at the hours when the pump has a representative proportion of wind energy is the moment when is really possible to store this energy in such way that later it could be used synchronously, controlled and stable when the hydraulic plant moves the water.

The current technology and the conditions of our islands make that reversible hydroelectric plants in Canaries can become a very important tool operation to stabilize the island electrical systems, thanks to their dynamic response to deal with incidents of the grid (can immediately enter in loading regulating generation-demand balance without the problems of cold start thermal power plants). This makes these reversible systems being considered as essential elements and integral parts of the power system stabilization of the islands, as well as elements of power generation.

Therefore, it will be supported the implementation of reversible hydroelectric systems in the Canary Islands, allowing maximum use of renewable energy and at the same time, bring major stability to Canary electrical system, seeking agreement with the State Government to define a suitable remuneration framework that encourages its implementation, and where appropriate, encourage policy changes that are necessary for this.

In this regard, the Integral Strategy for the Autonomic Community of Canary Islands (Canaries Plan), adopted by Council of Ministers on 9th October 2009, refers in paragraph 1.1 to the incorporation of hydro reversible plants in some Canary systems, based on two main sectorial objectives:

- To promote indigenous energy sources to make possible for renewable energy to contribute 30% of electricity generation in 2015.
- Reduce the energy dependence of the Canaries.

For this purpose, the Plan contemplates several reversible hydroelectric systems that will allow greater use of renewable energy by storing non-integral surplus (mainly wind) and at the same time, they will provide major stability to the electrical system of rapid response that this technology brings to the current generation fleet and consequently improving security and quality of electricity supply.

Among the projects included in the Canary Islands Plan is a system of these characteristics in La Palma, with a capacity of 15MW, but it is not expected to put it in operation in the outlook of planning.

The power provided to the island is not expected to be operational in 2020.

The implementation of any other energy storage technologies will also be supported, which help to preserve as far as possible a certain amount of energy to inject into the grid when required, to achieve a generation and management of electricity more efficient, thus buffering and intermittent fluctuations that increased penetration of renewable energies could result, analyzing the current regulatory framework and encouraging, where appropriate, the modifications necessary to facilitate such implementation.

4.3. Final energy demand

To understand a little better how the different measures and energy policies have being developed and implemented in Spain, it must take into account the different economic and energy crises that have occurred worldwide in recent decades. In Spain, the energy demand had been experiencing an upward trend over the past three decades, during which there have been four energy and economic crisis (1973, 1979, 1993 and 2008), worldwide, with negative impact on the economic activity and energy demand in most developed countries. That is why, under these circumstances, there were started to undertake policies aimed at reducing energy dependence and improving its efficiency.

The economic expansion of our country, since its joining to the EU, resulted in an increase in purchasing power, which was reflected in increased automobile and domestic equipment and a strong real estate sector development, factors among others, which have been decisive in the upward trends in energy consumption. In the early 90's, a new crisis was echoed by a slight attenuation of the energy demand. Subsequent developments had an upward trend until 2004, beginning, thereafter, a new stage in the evolution of energy demand, driven, among others, by the implementation of actions under the Strategy of Energy Savings and Efficiency in Spain 2004-2012 (E4), adopted in November 2003.

These features remain today, although there have been reinforced by the effect of the international financial crisis, which began around the second half of 2008. In Spain, the effect of this crisis is evident because of the slowdown in the construction sector that has traditionally been one of the engines of the national economy and also of the Canary Islands (the second largest sub sector important in the islands after the tourism). The loss of productivity in that sector and, in general, the economy as a whole, has been accompanied by an even sharper decline in energy demand, which confirms the existence of factors related to energy efficiency, external and prior to this crisis, with implications for improving indicators of intensity.

Currently observed trends have, therefore, synergy effects arising from a change since 2004 in improving the efficiency and the crisis which together affect a decrease in energy demand. In large part, this has been possible, because of the actions contained in the various schedules of electricity and gas sectors, which have led to further development of energy infrastructures needed for integration of new energy from renewable sources.

In a current context marked by uncertainty, it is expected that the crisis can act as a catalyst that stimulates the necessary changes designed to continue the improvements in efficiency and energy savings, which in the longer terms, will suppose economical savings and improve competitiveness of our economy. In this sense it should be borne in mind that oil is the first import product in Canaries and represents an expenditure of more than 1,200 million euros a year, just over 12% of the canary budget. Hence, and given the urgent need to reduce CO_2 emissions, due to environmental issues, the importance of achieving maximum energy savings by improving on one hand energy efficiency and increasing on the other, the penetration of renewable energies in the system.

Regarding the consumption of final energy, the evolution has followed a similar trend to that observed in primary energy with a tendency to stabilization and contraction of demand since 2004, as well as the effect of the current crisis in the period 2009 -2011.

Based on the sectorial distribution of demand in the Canaries, the transport sector is the largest consumer, with just over 50% of total final consumption, based primarily on petroleum products, which determines, in large part, the high energy dependence of the island. The next order of magnitude is presented in the tertiary sector, with about 20% of consumption, followed by sectors of various uses, among them, the residential and secondary. The primary sector is just over 1% of total consumption of the Archipelago.

In whole Spain, in 2010 the savings achieved 9.2%, calculated as a percentage of final energy consumption of the last five years immediately preceding the application of the Directive 2006/32/EC (that is, the average final energy consumption 2003-2007, inclusive), this is a higher percentage than 9% of savings proposed by the Directive for 2016. This means, in practice, that Spain anticipated by 2010 the target savings of the Directive, proposed for 2016.

The Action Plan for Energy Saving and Efficiency 2011-2020, approved by decision of Council of Ministers of 29th July 2011, meets the savings targets required by the Directive

2006/32/EC and is consistent with the overall objectives agreed by the European Council on 17th June 2010, concerning the improvement of primary energy efficiency by 20% in 2020.

In particular, based on the application of funds, the six measures listed below account for over three quarters of the funds which are applied annually in Spain: Appliance Renewal Plan, in some years, this plan has absorbed 40% of the total funds applied at IDAE-MITyC-territorial level, the programme of public aid in the industrial sector, the aid programmes for the renewal of existing outside street lighting installations aid programmes for rehabilitation of the thermal envelope of existing buildings, dedicated to the improvement of the energy efficiency of heating systems and the aid programmes directed to the local bodies-for the drafting of Sustainable Urban Mobility Plans (PMUS).

In the case of Appliance Renove Plan, the generalization of high energy rating (A + and A + +) in the sales areas and widespread awareness of energy efficiency label are indirect effects of the programme itself launched by IDEA and regional governments between 2004 and 2010, and the percentage of the population with regard to the labelling of energy efficiency when making a purchase, has increased from 42.8% in 2004 to 83.8% in 2010. The electrical appliances that required to be labelled are: refrigerators and freezers, washing machines, dishwashers, dryers, washer-dryers, domestic light sources, electric oven and air conditioning.

The following illustration shows the energy rating of appliances and their energy consumption.

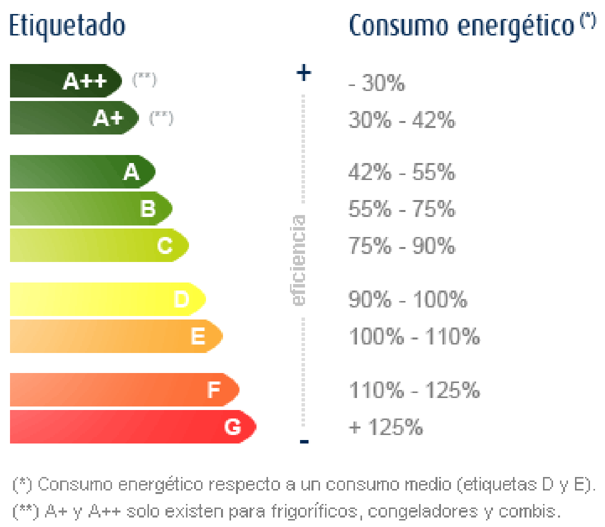

Figure 7 Energy labeling for appliances

The energy label classifies appliances by assigning letters and colours. A list of 7 letters and 7 colours ranging from A to G, and green to red, with the letter A and the green colour indicative of the highest efficiency appliance and red colour and G of lowest efficiency. Refrigerators, freezers and fridge-freezers also feature labelling, but in their case, there are also two energy classes more demanding, the A + and A + +, the latter being the most efficient of all that consume up to 70% less than the appliance of reference.

Below the sectors defined by the Action Plan of Energy Savings and Efficiency 2011-2020 are listed, that form the energy efficiency sector and, in general, products and services included in those sectors. Also are named the improvements, and additional priority that can be applied in each of the sectors that are subject to the cooperation agreements between the IDAE and regional government for subsidies.

Building sector

The products and services included in the building sector:

- Heat insulation and windows to improve energy efficiency.
- Low energy lighting and LED in buildings
- Air handling units and chillers of water of high energy efficiency.
- Energy-efficient boilers.
- Radiators for water at low temperature and radiant floors/ceilings.
- Lifts and elevators of high energy efficiency.
- Management systems, control and regulate systems of lighting and air conditioning in buildings

Priority and additional improvements recommended in the building sector and equipment are as follows:

Priority improvements:

1. Energy rehabilitation of the thermal envelope of existing buildings.
    - Window "Plan Renove".
    - "Plan Renove" for residential facades.
    - "Plan Renove" for residential roofs.
2. Improving the energy efficiency of heating systems of existing buildings.
    - "Plan Renove" for boilers.
    - "Plan Renove" for air conditioning equipment.
3. Improving the energy efficiency of lighting installations within existing buildings.

Additional improvements:

1. Construction of new buildings with high energy rating.
2. Training courses on the new energy regulations in construction.
3. Improving energy efficiency in existing elevator installations in buildings.

The development of specific legislation is also suggested, taking into account the Technical Building Code (CTE), mandatory nationwide, including special climate features of the island incorporating the recommendations of the Design Manual developed in the study of Sustainable Energy in Building in Canary Islands (MABICAN).

Transport sector

The products and services included in the transport sector are:

- Electric vehicles, hybrids, hydrogen and gaseous fuels.
- Motorcycles and electric bikes and hybrids.
- Low-emission vehicles.
- Electric buses, hybrid of hydrogen and gaseous fuels.
- Public systems of bicycle hire.
- Trains and trams (full machine).
- Stations or recharging points for electric vehicles and fuel gases.
- Information and Communication Technologies (TIC) applied to public and private transport.
- Energy-efficient tyres.

Measures and actions proposed, discussed in detail in section 4.1.1, are summarized below:

Priority improvements:

1. Sustainable Urban Mobility Plans (PMUS) and Transport Workers Plans (PTT).
2. Fleet management of road transport.
3. Efficient car driving.
4. Efficient driving of industrial vehicles.
5. Renewal of the cars fleet.
6. Renewal of transport fleet.

Additional improvements:

1. Greater participation of the public transport means and/or collective.
2. Development of infrastructure for recharging electric vehicles.

Domestic industry and office equipment

The products and services included in this sector are:

- Refrigerators and freezers of high energy efficiency.
- Ovens of high energy efficiency.

- Washing machines and dishwashers of high energy efficiency.
- Domestic air conditioners (up to 12 kW) of high energy efficiency.
- Computer equipment, multifunction/printers of high energy efficiency.
- Management systems.
- Other domestic appliances of high energy efficiency.

Priority actions:

1. Plan Renove of Appliance. If this measure is applied, at least half or one third of the Canarian population would be talking about significant energy savings in the sector itself, only by improving energy efficiency. If best practices were applied also on the rational use of energy in the sector, the savings would be even greater.

Utilities sector

The products and services that are included in the utilities sector are:

- Low energy lighting and LED in street lighting.
- Traffic lights using LED technology.
- Control and regulation systems of street lighting.
- Variable speed drives on electric motors for pumping water supply, water treatment and purification.

Additional actions:

1. Renovation of the facilities of existing external lighting.
2. Studies, feasibility analysis and audit facilities of existing external lighting.
3. Making energy training courses for municipal technicians that allow improving the energy efficiency of municipal facilities.
4. Improving the energy efficiency of existing water treatment facilities, water supply, wastewater treatment and desalination.
5. Implementation of all measures of Building and Equipment to the buildings and public facilities.

Industry sector

The industrial sector in the islands has not been developed as in other regions of Spain where they do have considerable weight in the economy and in energy dependence (the second largest sector is energy demanding nationally). In the Canary Islands this sector is one of that consumes less power followed by the primary one. The products and services included in the industrial sector are:

- Insulation of piping and equipment in industry.
- High water chiller of high energy efficiency.
- Industrial boilers of high energy efficient.
- Electric motors of high efficiency.
- Variable speed drives for electric motors.
- Absorption machines.

Priority improvements:

1. Programme of public aid.

Additional improvements:

1. Energy audits.

Agriculture and fisheries sector

This sector, as discussed above, just overcomes 1% of total final energy. But some measures can be applied to products and services included in this sector:

- Harvesters, seeders and tractors of high energy efficiency.
- Drip irrigation equipment.
- Variable speed drives on electric motors for pumping irrigation water.
- Management systems, control and regulation of air conditioning in greenhouses.
- Thermal insulation in greenhouses.

Additional improvements:

1. Promotion campaigns, training and improved techniques for efficient use of energy in agriculture and fisheries.
2. Impulse for the migration of sprinkler irrigation systems or gravity drip irrigation systems.

3. Improving savings and energy efficiency in the fisheries sector.
4. Energy audits and action plans for improvements on farms.
5. Improved efficiency of tractors in use by means of ITV.
6. Support for migration towards conservation agriculture.

All sectors

- Energy services provided by Companies of Energy Services (ESE).
- Services provided by the Public Administration on energy efficiency.
- Advertising on energy efficiency.
- Other services relating to energy efficiency (engineering, consulting, auditing, certification, installers, maintainers).

In addition to the measures described above, contained in the Action Plan of Savings and Energy Efficiency 2011-2020, in this study are also shown other measures that seek to strengthen and promote the actions proposed in the previous subsections and that should support the different public administrations (local, regional, autonomic and / or national) involved in their possible implementation.

The following actions are proposed in the public sector to exercise exemplary role:

- Support for energy audits of municipal and insular facilities in order to identify the inefficient equipment or poorly maintained facilities that have an impact on energy consumption and electricity bills.
- Support for conducting audits of consumption associated with municipal and insular infrastructures likely to be the subject of renewable energy supply projects: wind energy of small power (up to 100 kW), solar cooling and solar photovoltaic, among others. As a result of these audits a specific plan can be developed for incorporation of renewable energy systems making the most of the Royal Decree of self consumption adopted on 18th November 2011.
- Support for wind farm projects associated with consumption of street and road lighting systems the way that the transformation centres, to which is connected this lighting, allow receiving associated renewable generation.
- Support for proposals for renewable generation projects associated with storage and load management systems that belong to public infrastructures which allow, in some way, the power control.
- Support for the identification of potential application of thermal solar energy for the production of cold and heat necessary for air conditioning of sports and health infrastructures, and also putting facilities in the centres of higher energy consumption already existing or under construction.

Referring to the previous points, it could be suggested that, in case of wind farms with associated consumption, Canary public institutions may relocate wind production according to the physical location of power consumption, above all in those cases where the electricity consumptions are scattered over a large geographic area (lighting or pumping).

Other interesting measures are:

- Support for promotion of the introduction of distributed generation, through micro grids associated to industries or residential areas where the electrical grid is weak, and the introduction of hybrid wind power generation systems - diesel at sites where the renewable resource provide project profitability.
- Support measures to improve energy efficiency in industry, to ease the economic viability of the investments into the industry sector and energy savings in order to achieve the energy savings potential identified.
- Support for innovative projects related to the direct use of renewable energies in the primary sector, such as drying of agricultural products with solar energy, which allows studying the viability and competitiveness of the marketing of manufactured products.
- Implementation of mandatory measures in the tourism sector: recommendations contained in the Energy Efficiency Guide for Hotel facilities in the Canary Islands that promotes the principles of rational energy use and benefits of the introduction of renewable energies in the tourism sector.

On the other hand, it is also should be taken into account the important role that plays the water sector in the islands. Insularity forces to be self-sufficient in water resources. The geological and climate nature of the island does not favour the existence of permanent surface water (rivers and lakes), but has permitted the storage of large volumes of groundwater.

Among the possible actions in the water sector to reduce energy consumption are the following:

- A water saving policy in all sectors: urban / tourism, agriculture and industry.
- To take advantage optimally of all available resources, including sewage, purified waters and desalination.
- Improving energy efficiency of processes and reduce pollution and emissions associated with water uses.
- Reduce losses in the water distribution system.

In any case, the rational use of water should be promoted in all sectors of productivity and consumption, carrying out specific programmes to raise awareness on water use and encouraging the use of technologies for the reduction in the consumption of it.

Other actions to be undertaken by the government:

- Special territorial planning of energy infrastructures
    - Assessing the potential of renewable resources, development of forecasting models of renewable energy sources and studies of the dynamic behaviour of the electrical grid.
    - Further progress in land use planning for renewable energy installations, mainly wind and photovoltaic, based on the evaluation of energy resources, the dynamic behaviour of electrical power and the limitations in the territory.
- Regional and local strategic planning:
    - Further progress in the integration of criteria and rules for land use and municipal ordinances that promote the reduction of energy requirements in buildings and transportation.
    - Implementation of an action plan for sustainable energy for all municipalities in the scope of the Covenant of Mayors.
- Infrastructures that promote sustainable energy planning:
    - Flatten the demand curve by recharging battery of electric vehicles and/or changing the hours of operation of equipment with high intakes.
    - Installing of stabilization systems to help mitigate power interruptions in the production of wind and photovoltaic energy in the electrical grid.
- Transport and mobility planning:
    - Installation of supply infrastructure for electric vehicles.
    - Preparation of a mobility plan that covers the preparation and parking of traffic in major cities, favouring public transport and electric vehicles and other environmentally friendly vehicles, and pedestrian circulation.
- Requirements and standards for energy efficiency:
    - Definition of rules and criteria for energy efficiency and renewable energy use in the specifications of the tender documents for works, purchase of goods and services.
- Advisory services:
    - Creating an online help information and a forum with questions and answers, based on e-learning platform for home users in order to answer the questions and provide advice on energy efficiency, renewable energy use and reduction of CO_2 emissions.
- Financial support and subsidies:
    - Financial support for public promoters and non-profit organizations to put into practice the actions of the Action Plan for Sustainable Energy.
    - Financial incentives to business and real estate promoters, so they can put into practice voluntary measures of energy efficiency, renewable energy use for self consumption, sustainable mobility and reducing of CO_2 emissions.
- Awareness and creation of grids:
    - Development of guides and brochures on mobility awareness, energy efficiency and the use of renewable energy for consumers, promoters and professionals.
    - Promotion of cooperative activities in the field of energy between the local and regional public administration, research institutes, business associations, companies, credit institutions, NGOs and media.
    - Development of cooperation projects in the field of energy with other regions, particularly with the outermost regions that have similar problems.
- Training and education:

   - Development of educational materials on environmental awareness and information sessions and other educational activities for sustainability that includes students and teaching staff.
- Monitoring
   - Installation of systems to monitor and manage energy consumption in the residential sector and service buildings (public and private).
- Legislation
   - Increased monitoring/inspection of the relevant legislation on energy efficiency.

Finally, it should be mentioned a key part of achieving the attainment of the objectives being set to achieve 20% of energy efficiency by 2020: communication and public awareness of the need to save energy. The actions identified are based on a strategy of long-term effort, materialized through a continuous and constant presence in the media that will produce the greatest number of citizens in a constant manner. All communication activities are intended to promote awareness, mobilization and public action for the responsible use of energy through the following objectives:

- The citizen-consumer must value the energy as a scarce resource that has to be nurtured with care.
- Saving energy from awareness of the problem and create currents of opinion, mobilization and citizen action in the range of everyday activity: home, work and means of transport.
- Provide information to citizens on good practice to know how to save energy from personal action.
- Mobilizing citizen action in the challenge to consume energy wisely and responsibly, as citizens are responsible for 30% of total energy consumption.
- Promote the purchase of equipment of the highest energy efficiency (houses, cars, appliances, air conditioning, lights, etc...).
- Promote public transport in general, as means of displacement alternative to private cars in urban centres, in particular.
- Promote the responsible use of private vehicles. In the city, 50% of car trips are for distances of less than 3 km and 75% of trips in this mode will be done with a single occupant.
- Promote energy conservation through responsible use of air conditioners in the summer. These campaigns are aimed primarily to achieve a reduction in consumption in the service sector (hotels, shopping centres, leisure centres, etc...).

The frequency of communication actions and institutional advertising should be annual in order to maintain constant pressure on citizens.

5. ORGANIZATION AND FINANCING MECHANISMS

To implement the action plan it is necessary to establish an organizational structure and of coordination that ensures the appropriate experience, invigorates the participation and commitment of the parties involved and provides the means of financing the projects. To make sure that the objectives and goals could be achieved it is also necessary to establish mechanisms for tracking and monitoring.

5.1. Coordination and organization structures

The Department of Employment, Industry and Trade of the Canary Islands Government is responsible for the formulation and implementation of energy policy in the Canaries, while the Local Island Government is responsible for territorial planning of energy infrastructures.

Action Plans for Sustainable Energy Island (ISEAPs for short in English) are being developed to be driven by Local Island Government. The coordination and implementation of the Action Plans will be carried out by the Coordination Committee, which shall be integrated by representatives from the following institutions:

- Canary Islands Government: Department of Employment, Industry and Trade
- Island Local Government of La Palma.
- Endesa.
- Red Eléctrica.
- Instituto Tecnológico de Canarias, S.A.
- Cluster RICAM.

The Coordination Committee, integrated by the representatives of the parties involved, will be responsible for ensuring the implication and participation of the society, and for supervision and monitoring of plan actions.

5.2. Technical competence

In the Canaries there is large experience in the design and implementation of energy plans, as well as in the areas of Renewable Energy, Energy Efficiency and Environment. The Canary Islands Institute of Technology has a long history in research, knowledge and cooperation of work in renewable energy, energy savings and efficiency, as well as in water technology. The mentioned above Institute has collaborated with other regions (Mauritania, Cape Verde, etc..) in advising on energy plans, technical recommendations and training in renewable energy and water technologies, so, according to this there were established and developed the measures needed to design and implement this Action Plan.

The Department of Employment, Industry and Trade has developed The Canary Islands Energy Plan (PECAN), the integral document of planning prepared by the Government of the Canary Islands. The current document was approved by the Parliament of the Canary Islands at its meeting on 29th March 2007, is developed for all the Canary Islands and has conducted a review of it in January 2012 (it is a subject to public inquiry and consultation and report). The technicians of the Council are qualified and trained in issues related to energy planning and renewable energy.

From the Island Local Government of La Palma is made up, monitoring and coordination of Territorial Planning, so the Island Local Government of La Palma staff is trained and has expertise in issues related to energy planning and renewable energies.

In the electricity sector, the company responsible for the generation and distribution, Endesa, and transmission and system operator, Red Electrica (REE), has a staff that covers different areas of engineering and management and experience and skills for putting into practice the actions related to this sector.

In the private sector, energy companies and business associations from the renewable energy sectors, environment and water resources of the Canary Islands have been grouped into the cluster RICAM, with the main objective of increasing the competitiveness of the business and its regional, national and international projection renewable energy, environment and water resources.

5.3. Participation of the involved agencies

To direct the participation of involved parties in the implementation of ISEAPs the periodical meetings will be held with the Monitoring Committee, where the activities and progress of the implementation of the plan, identification of existing limitations or potentials and for learning about measures to optimize the results and correct deviations will be made known.

Also, it would be used, as a mean of communication of result and degree of implementation of the organized events plan, the forums and online publications, where will be announced information on the actions of the plan, benefits and incentives, conducting public awareness to achieve the objectives of regional development, increase of renewable energy and environmental improvement.

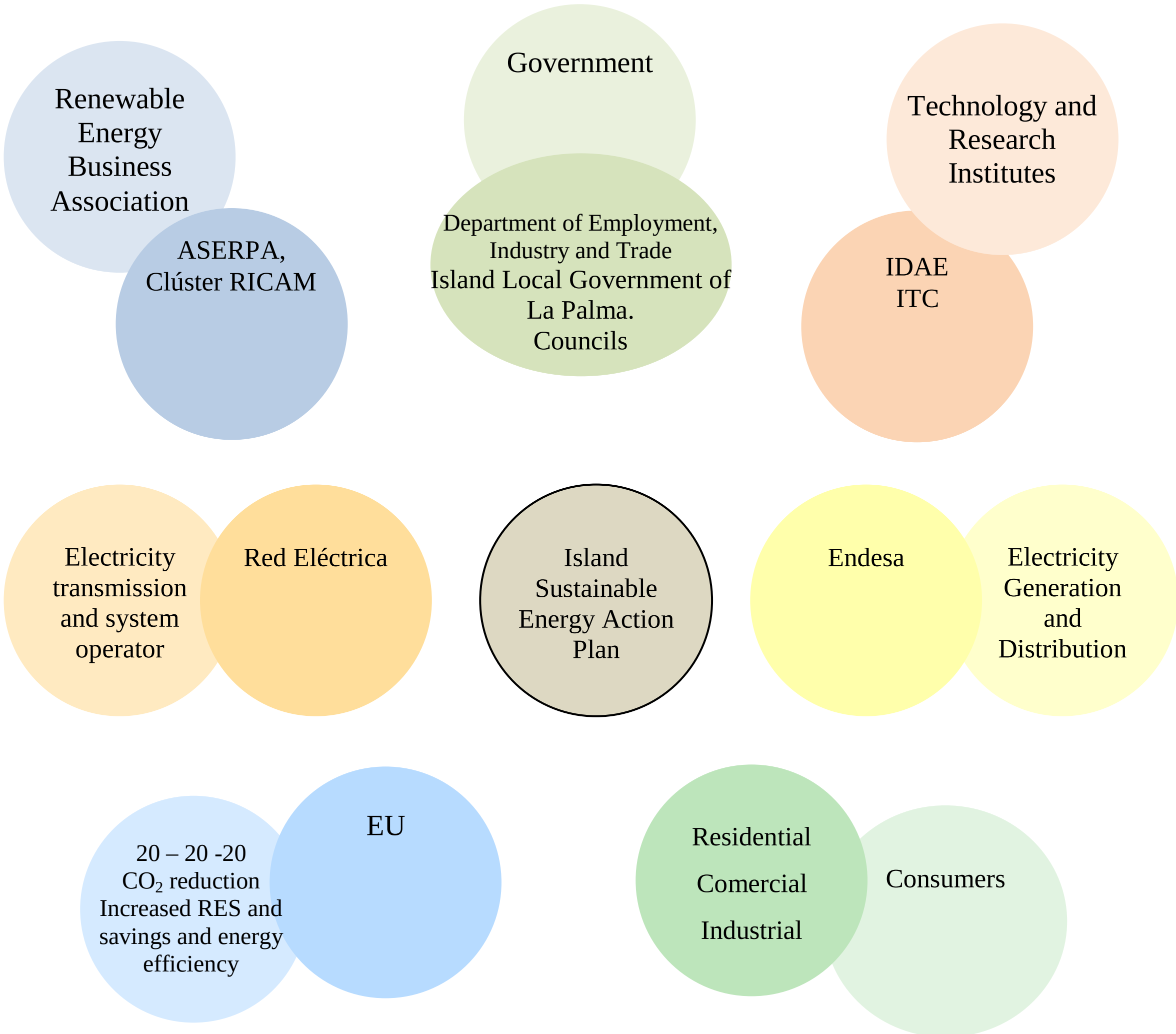

Figure 8 Schematic of the agents involved in the energy sector.

Different agents are committed to providing the data of energy consumption by sector (UNELCO-ENDESA), update the list of new renewable installations (Department of Industry), the fuel sales data (DISA, REPSOL and others), and all those energy data that are necessary to perform an upgrade of energy statistics of the island with the new data in order to assess the degree of implementation of ISEAP.

5.4. Budget

Sectors and Areas of action	Actions (one line for each share-insert lines if needed, to exclude actions of TS)	Responsible for the implementation	Implementation Schedule Year from	Implementation Schedule At year end	Investment costs [EUR]
RESIDENTIAL					
Hot water	Installation of 1,860m^2 of solar collectors	Citizens Government of Canary Islands, Island Local Government of La Palma	2012	2020	1,041,600
TERTIARY SECTOR					
Accommodation and food service activities	Installation of 4,340m^2 of solar collectors	Entrepreneurs, Canary Islands Government, Island Local Government of La Palma	2012	2020	2,430,400
TRANSPORT					
Passenger land transport (public transport, taxis, school buses, occasional transport, government vehicles, etc..) And transport of goods by road and removal services	Promoting the purchase of hybrid vehicles, plug-in hybrid and electric (Plan Movele y Plan Renove).	Government of Spain, Government of Canary Islands	2012	2020	289,325
	Acquisition of hybrid vehicles, plug-in hybrids and electric.	Government of Canary Islands, Island Local Government of La Palma, Councils, transport companies	2012	2020	45,063,769
	Promoting the use of biofuels.	Government of Canary Islands	2012	2020	21,694
	Use of biofuels.	Government of Canary Islands, Island Local Government of La Palma, Councils, transport companies	2012	2020	
	Efficient driving courses.	Government of Canary Islands	2012	2020	30,375
	Promoting the purchase of hybrid vehicles, plug-in hybrid and electric (Plan Movele y Plan Renove).	Government of Spain, Government of Canary Islands	2012	2020	858,989
	Acquisition of hybrid vehicles, plug-in hybrids and electric.	Citizens	2012	2020	133,791,717
	Promoting the use of biofuels.	Canary Islands Government	2012	2020	82,722
	Use of biofuels.	Citizens	2012	2020	

Sectors and Areas of action	Actions (one line for each share-insert lines if needed, to exclude actions of TS)	Responsible for the implementation	Implementation Schedule		Investment costs [EUR]
			Year from	At year end	
	Efficient driving courses.	Canary Islands Government	2012	2020	91,125
	Efficient driving courses to civil servants	Canary Islands Government, Island Local Government of La Palma, Councils	2012	2020	406,596
SECONDARY ENERGY PRODUCTION AND FLOWS OF ENERGY					
Electricity (not renewable)	Increase the efficiency of generation set conventional fixed in 40% by substitution of the more obsolete and inefficient. As of 2014, passed by 52%	Private sector	2012	2020	220,000,000
Hydraulic	Reach 7.74MW	Private sector, Government of Canary Islands, Island Local Government of La Palma	2014	2020	8,514,000
Wind	Reach 28MW by installing new wind farms and upgrading of the oldest	Private sector, Government of Canary Islands, Island Local Government of La Palma	2012	2020	27,650,000
Solar	Reach 15.6MW installing new parks or gardens photovoltaic mainly on roofs	Private sector, Government of Canary Islands, Island Local Government of La Palma	2012	2020	31,200,000
Biomass	Biogas, reaching 2.70MW	Private sector, Government of Canary Islands, Island Local Government of La Palma	2013	2020	2,430,000
Distribution losses and own consumption	Improving the efficiency of transmission and distribution network by replacement or extension thereof. From 2015 it would rise from 90% to 92%.	REE and private sector	2015	2020	
Total					**473,902,312**

Table 45. Budget

5.5. Funding sources and instruments

The targets of primary and final energy savings with the consequent reduction in CO_2 emissions of this Plan would be possible as a result of a series of investments by certain agents.

The source of funding for implementation of this energy plan will be, mainly, the **Ministry of Industry, Trade and Tourism** through the Programme of subsidies and agreements of co-operation, and on the other hand, **private funding sources**. However, the Government of Canary Islands, the Island Local Government of La Palma and the Department competent in energy field would also be involved in funding for the implementation of the measures proposed in this Plan.

On the other hand, among the sources of national and international funding for R&D&I stand out those listed in the following subsections.

5.5.1. National programmes

Within the national framework, there are funding programmes which are allocated to promote and support R&D and innovation. One of these programmes is **the National Plan R&D and innovation 2012-2015**. The National Plan for Scientific Research, Development and Technological Innovation (National Plan of R&D and innovation) is the programming measure that the Spanish system of Science, Technology and Business counts with for the achievement of the objectives and policy priorities research, development and technological innovation of our country in the medium term, as defined in the Law on Science and the National Strategy for Science and Technology (ENCYT).

The **Centre for Industrial Technological Development** (CDTI) is a Public Enterprise under the Ministry of Science and Innovation (MICINN), which promotes innovation and technological development of Spanish companies. Since 2009 this is the entity of the Ministry of Science and Innovation (MICINN) which directs the requests for funding and the support for R&D and innovation projects of Spanish companies at the state and international levels.

As a significant body in the promotion of renewable energy sources, the investment activity of the **Institute for Energy Diversification and Saving of Energy (IDAE)** stands out, this constitutes one of the strategic lines of action of the IDAE. Its objective is to promote projects having a clear component of technological innovation.

Finally, it should be emphasized that each of the **Autonomic Communities** has assigned responsibilities related to the promotion of renewable energy: developing plans and programmes for promoting and encouraging of diversification, energy savings and use of renewable energy. In our case, the competent body is the Canary Islands Government.

5.5.2. International programmes

Of the international programmes, the most prominent, given its importance and high-impact, is the **VII Framework Programme for Research and Technological Development 2007-2013**. The Framework Programme for Research, Technological Development and Innovation of the European Union (PM) is the main legal and economic instrument for financing community research where the priorities adopted in the European Union in this area and the budget allocated for each one of them for a period of seven years are defined.

Moreover, the **European Regional Development Fund (FEDER**) aims to strengthen economic and social cohesion in the European Union by correcting imbalances between its regions. On the other hand, the **Cohesion Fund** finances activities which are registered within the areas of transport European networks, in particular, the priority projects of European interest that are defined by the European Union; and in the field of environment. In this regard, the Cohesion Fund may also intervene in projects related to energy or transport, provided they present clear advantages to the environment: energy efficiency, the use of renewable energies, development of rail transport, support intermodality, strengthening public transport, etc.

Likewise, the financing instrument in the European Union for Environment is the LIFE + **Programme**. The overall programme goal is to contribute to the implementation, updating and development of environmental policy and legislation of the European Union through the co-financing of demonstration projects with added value in Europe. The topics of greater interest within the possibilities offered by the programme are: energy and climate change, environmental management and quality of life of the urban environment.

In turn, the EC presents the **Strategic Energy Technology Plan (SET-Plan**) in order to establish a road map for a coordinated research that accelerates the development of technologies for low carbon, clean, efficient, affordable and their big scale penetration into the market.

Meanwhile, the **COST European Cooperation in Science and Technology** is an intergovernmental framework created in 1971 by 19 European countries, together with the European Communities. COST has now 35 member countries in Europe (27 Member States of the European Union, 3 Member States of the European Free Trade Association (EFTA), 3 adherents and candidate countries, two potential candidates, and Israel as the country partner) . Since 2003, COST has been funded through a subsidies' agreement between the Commission and the European Science Foundation (ESF) supported by the Framework Programme. In the same line, **e +,** which is an international project R & D led by companies, both at multilateral and bilateral levels, refer to the added value of innovation made in international key and enable companies to strengthen their technological capacities, while expanding the impact of their products, processes and services in global markets.

Finally, with the **Co-operation Missions CDTI** it is supposed to make easier the assistance to events of reference, particularly, those organized by the EC, and promote the participation of Spanish companies in international technological co-operation projects managed by CDTI.

5.6. Monitoring and follow-up

The Plan compliance review will be carried out every four years. It is not advisable to review the Plan very often, given that by their proper nature, many of the measures proposed are given a determined deadline and usually multi-year implementation, and therefore, an often review of the Plan would only create a certain degree of confusion and even paralysis.

Therefore, adopting a four-year term for its review provides a compromise between these needs for stability in the actions and further developments that are produced at scientific and technological levels in this area. This does not exclude that in case of exceptional events which are advised, it would be necessary to revise the Plan in advance in order to adapt it to the new situation.

Responsible for monitoring and periodic monitoring of the Plan will be the Government of the Canary Islands together with the Island Local Government of La Palma which will be in charge of carrying out technical work that are necessary for this purpose. The contents of the review will be: evolution and management of demand, generation capacity, disposal and storage of renewable energy, energy generation infrastructures, transmission and distribution of electricity and oil, the conditions derived from international agreements and European regulations and state in the materialization of energy needs, energy efficiency, studying new technologies and regulatory issues that affect this field and ground transportation (automotive industry, guided transportation and electric cars).

Data collection for the control and monitoring is done according to the following table:

Data	Information source	Review time
Demand for fossil fuels	• Fuel distribution companies. • Public transport companies and discretionary. • Sampling of users in key sectors.	Annual
Electricity demand	Electricity company, Endesa	Annual
Production of electricity	Electricity company, Endesa	Annual
Installing renewable energy systems	• Electricity company. • Business installers. • Government of Canary Islands, registration special treatment facilities.	Annual
Implementation of action plan	• Managers responsible for implementing the plan. • Monitoring Committee	Annual

Table 46. Data for control and monitoring

The energy statistics will be made with the collected information and include an energy balance that reflects the increased energy from new renewable energy facilities being already launched, energy savings achieved and the inventory of CO_2 emissions, with the purpose to provide the development of indicators related to the established aims and goals, and evaluating the result of actions implemented. The Monitoring Committee will conduct an analysis of the indicators related to objectives and goals and progress of actions. There will be a biannual meeting in order to discuss the results obtained, deviations if any, and the solutions to optimize the implementation of actions´ plan. In case of significant deviation in implementation of the actions and results, and relevant changes of socio-economic and political areas, which may put in danger the objectives fixed for 2020, the Monitoring Committee may propose reviews pf the Action Plan for the island of La Palma (ISEAPs).

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PACT OF ISLANDS

Elaboración:

Autoridades Locales:

Co-financiado por:

Aviso Legal: