



JESSICA

***JOINT EUROPEAN SUPPORT FOR
SUSTAINABLE INVESTMENT IN CITY AREAS***

JESSICA Instruments for Energy Efficiency in Greece

EVALUATION STUDY

FINAL REPORT



REMACO SA
MANAGEMENT AND DEVELOPMENT CONSULTING

March 2010

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REMACO SA
MANAGEMENT AND DEVELOPMENT CONSULTING
100 Kifisias Ave. & 83 Marathonodromou str.
15125 Marousi, Greece
Tel. +30 210 6725966, Fax +30 210 6725972
e-mail: remaco@remaco.gr
www.remaco.gr

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1 Introduction

1.1 Energy Efficiency Policy in Greece

1.1.1 *The National Action Plan for Energy Efficiency*

Energy efficiency policy of Greece is articulated by the national action plan for energy efficiency (NAPEE) for the period 2008-2016, as submitted to European Commission. The overall strategy of NAPEE is based on the establishment of an efficient energy market, and the utilization of state of the art energy technologies. The main objective of NAPEE is to achieve a 9% reduction of energy consumption until 2016, namely to save 14,41 TWh and enhance the energy autonomy of the country. NAPEE provides for the following categories of measures:

- **Horizontal measures.** These measures are not directly linked to any sector of economic activity. They are supporting interventions such as the establishment of standards for energy efficiency, legislative initiatives regarding energy efficiency (such as the incorporation of directive 2006/32 into the national legislative framework), energy measurement systems, training and other initiatives that lead to the adaptation of contemporary tools and techniques.
- **Cross-sectoral measures** which regard energy efficiency of buildings, implementation of energy management systems in services and public sector and the promotion of co-generation and district heating systems.
- **Measures in the public sector**, such as the obligatory implementation of “green procurement” procedures, installation of solar systems, implementation of an integrated energy plan for Local Authorities, establishment of energy service desks and classification of Municipalities according to their energy consumption. The measures regarding energy efficiency in public sector’s buildings have been implemented by the issuance of a joint ministerial decision (see also paragraph 1.1.2), while the implementation of green procurement has been launched by the draft law “measures for improving energy efficiency and energy services” (see also paragraph 5.2.2). The draft law provides for ministerial decisions to be issued which will set the specifications regarding public sector’s procurement. The installation of solar systems has been launched by the new national program “Photovoltaics on Roofs” (see also paragraph 3.3). The measures regarding integrated energy efficiency plans and classification have not been launched yet.

- **Measures in transport**, such as eco-driving, replacement of obsolete vehicles, tax incentives, initiation of quotes regarding the participation of new vehicles in public fleets, development of mobility plans aiming to maximize the usage of public transportation.

Moreover, NAPEE focuses on the improvement of procedures for energy data collection, analysis and forecasting. It also provides for planning and implementing well- targeted promotional campaigns, at local and national level, aiming to mobilize and sensitize people so that to maximize the results of energy efficiency measures. It is expected that the implementation of NAPEE will contribute to significant reduction of fossil fuels and electric power, while it reinforces the further penetration of natural gas and Renewable Energy Sources into the energy system of the country.

1.1.2 Legislative Initiatives

Greece has implemented some of the measures taken by EU, namely:

- **Directive 92/42/EEC** on hot-water boilers fueled by liquid or gaseous fuels by presidential decree No 59/95 of 21 February 1995;
- **Directive 96/57/EEC** on refrigerators, freezers and combinations incorporated in Greek Legislative framework by presidential decree No 178 of 5 June 1998.
- **Directive 2000/55/EC** on ballasts for fluorescent lighting by Act 1407 of 22 October 2001.
- **Directive 92/75** on energy efficiency labelling of household appliances was transposed by Presidential Decree No 180/1994, which is supplemented by other decrees imposing labelling requirements for specific product groups.
- The **Joint Ministerial Decision (Δ6/B/14826/2008)** for «measures for improving energy efficiency and savings in the public domain», predicts the ineligibility of public spending for energy high consuming equipment and the designation of energy supervisor in public sector buildings.
- Greece adopted the **Directive 2002/91/EU** by National Law 3661/2008 for the reduction of energy consumption in buildings.
- The law 2773/99, amended by recent issuance of law **3468/2006** for arranging all legal and operational matters pertaining to power generation from Combined Heat and Power (CHP), co generation as well as to Renewable Energy Sources (RES), provides for electricity production by the private sector from CHP or RES. Furthermore, it assures sales of electricity power generated by independent producers or auto producers (surplus) to

the Hellenic Transmission System Operator (HTSO) at fixed prices per technology. The L.3468/2006 is in the process of modification, aiming to rationalize the licensing procedures, since according to the current legislative framework, it takes approximately 3-5 years to acquire the necessary licenses. The draft law, which is currently under public consultation, aims to reduce the time required to issue the appropriate licenses to 8-10 months.

- “New” **institutional tools**, are introduced such as the Public Private Partnerships (PPP) by the Law 3389/2005, the Energy Performance Contract (EPC) and Third-Party Financing (TPF).

1.1.3 Energy Efficiency Policies regarding Industry

Since 2000 in industry, the dominating instrument to improve the energy efficiency was the “Operational Program for Competitiveness 2000-2006 (OPC)”.

This program enforced investments in the field of Rational Use of Energy - Energy Efficiency, CHP and intended to the promotion of Renewable and other indigenous energy sources

Additionally, the “Private Incentives for Economic Development and Regional Convergence” development law 3299/04 provides for 15%(min) up to 60% (max) grants to industrial and tertiary sector’s enterprises for energy efficiency or RES investments.

In parallel, the Emissions Trading Scheme implemented to 151 energy-intensive industrial venues is the main mechanism to improve the energy efficiency. It was started in the beginning of 2005.

1.1.4 Energy Efficiency Policies regarding Transport

Since 1999, the Law 2682 promotes the purchase of low polluting vehicles with fiscal incentives such as tax reductions for electric, alternative and hybrid vehicles satisfying the specifications of the EC Directive 94/12 or more recent Directives. Additionally these vehicles are exempted from traffic restrictions e.g. access in the Athens city centre.

Since January 2002, the Joint Ministerial Decision 90364/2002 concerning the introduction of fuel consumption and CO₂ emissions label for new cars, incorporated the EU Council Directive 1999/94/EC in Greek legislative framework. The measures that are proposed concern the adoption of regulative and administrative actions. Indicatively, they concern: development of urban mobility projects, labeling in cars,

connection of taxation of vehicles with CO₂ emissions, measures of awareness, sensitization and education of public on the increase of use of public transport and the promotion of Eco-Driving, infrastructures in the sector of transports, replacement of old vehicles with new energy efficiency ones (natural gas, hybrid, bio-fuel).

1.1.5 Financing

Energy efficiency projects were subsidised under the framework of Greek development laws and operational programmes for energy and competitiveness. The Development Law provides subsidies for improving energy efficiency and promoting renewables in the industrial and service sectors and for electricity generation by co-generation systems or renewables. Grants range from 15% to 60% of total investment cost, depending on the geographical location and the size of the enterprise applying for grants. Tax credits are also available to investors as an alternative to grants.

In the framework of CSF II one of the five sub-programmes of the Operational Programme for Energy (OPE) was on energy conservation to increase energy efficiency in the industry and service sectors. It was planned to provide subsidies of up to 45% for energy conservation investments made in these sectors. The projects that were approved for this programme had a total budget of €127 million of private investments to be used on energy end-use efficiency, and they were implemented between 1997 and 2001.

In the context of the CSF III, the Operational Programme for Competitiveness 2000-2006 (OPC) continued to subsidise energy conservation investments. Both of these programmes offered subsidies not only to promote efficient energy in end-use but also to promote co-generation and fuel substitution. Under OPC, the total budget utilized for these three activities was €168 million, and the estimated primary energy savings achieved were 280 ktoe/year.

Apart from the operational programmes, energy efficiency projects in Greece have received significant financial support from the EU. During 1997-2000, the EU SAVE, THERMIE and ENERGIE programmes have financed projects with a total budget of €20,4 million (of which about 40% were EU contributions).

1.2 Energy Efficiency & Sustainable Urban Development

The purpose of this paragraph is to provide an overview of the interrelations existing between energy efficiency and sustainable urban development, in order to justify the implementation of JESSICA within the area of energy efficiency. In order to serve

this purpose the basic definitions are provided, whereas the main constituents of the concepts involved are described.

1.2.1 Background - Definitions

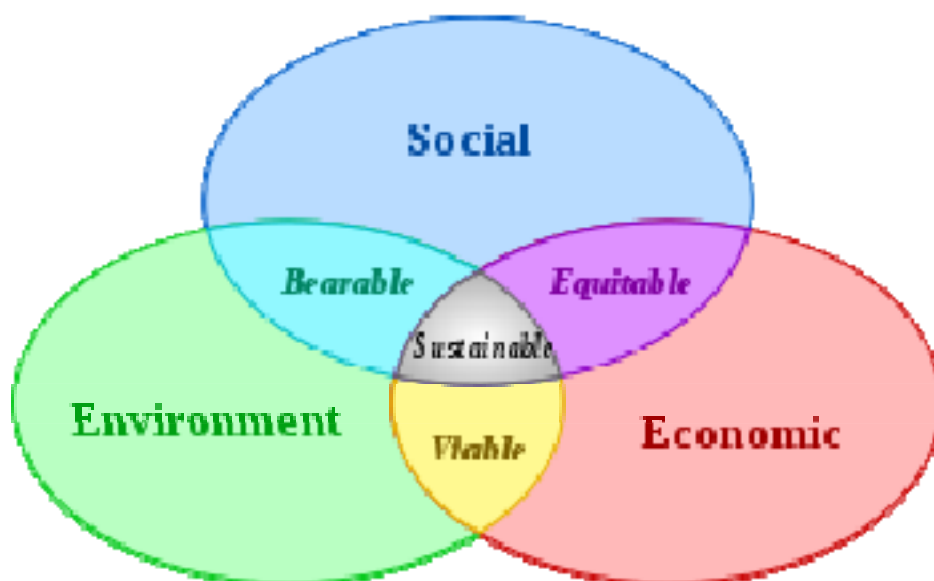
1.2.1.1. Sustainable Development

Sustainable Development is a *pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for future generations.*

The field of Sustainable Development can be conceptually broken into three constituent parts or pillars (Graph 1):

- **Environmental Sustainability:** Environmental sustainability is the process of making sure current processes of interaction with the environment are pursued with the idea of keeping the environment as “pristine” as naturally possible based on ideal-seeking behaviour. An “unsustainable situation” occurs when natural capital (the sum total of nature's resources) is used up *faster than it can be replenished.*
- **Economic Sustainability:** No economic system is sustainable unless it accommodates the ecosystems on which it depends. Sustainability economics represent: “... a broad interpretation of ecological economics where environmental and ecological variables and issues are basic but part of a multidimensional perspective”.
- **Social Sustainability:** Social Sustainability encompasses human rights, labour rights, and corporate governance. In common with environmental sustainability, social sustainability is the idea that *future generations should have the same or greater access to social resources as the current generation.* Social resources include ideas as broad as other cultures and basic human rights (employment, health, participatory rights). The different aspects of social sustainability are often considered in Socially Responsible Investing (SRI). Social sustainability criteria that are commonly used by SRI funds and indexes to rate publicly-traded companies include: community, diversity, employee relations, human rights, product safety, reporting, and governance structure.

Graph 1: The Pillars of Sustainable Development



The Renewed EU Sustainable Development Strategy was adopted by the European Council in June 2006. It is an overarching strategy for all EU policies which sets out how we can meet the needs of present generations without compromising the ability of future generations to meet their needs. The Sustainable Development Strategy deals in an integrated way with economic, environmental and social issues and lists the following seven key challenges:

- Climate change and clean energy
- Sustainable transport
- Sustainable consumption and production
- Conservation and management of natural resources
- Public health
- Social inclusion, demography and migration
- Global poverty

1.2.1.2. Integrated Urban Development

Cities play a vital role for the development of European Regions. They are key to increasing the European Union's worldwide competitiveness. Cities are home to the majority of jobs, firms and higher education institutes and their action is decisive in bringing about social cohesion.

Cities are also centres of innovation, economic growth, social transformation,

healthcare, and education—and most are taking a proactive approach to address the **urban sustainability challenge**. The unprecedented development of new cities around the globe, however, and the need to renew outdated 20th century infrastructures in mature cities, require the creation of **new urban design**, metropolitan governance, and infrastructure investment models.

Economic development can only be sustainable when it is accompanied by measures designed to reduce poverty, social exclusion and environmental problems. The integrated approach not only encourages growth and jobs throughout Europe, but also pursues social and environmental objectives.

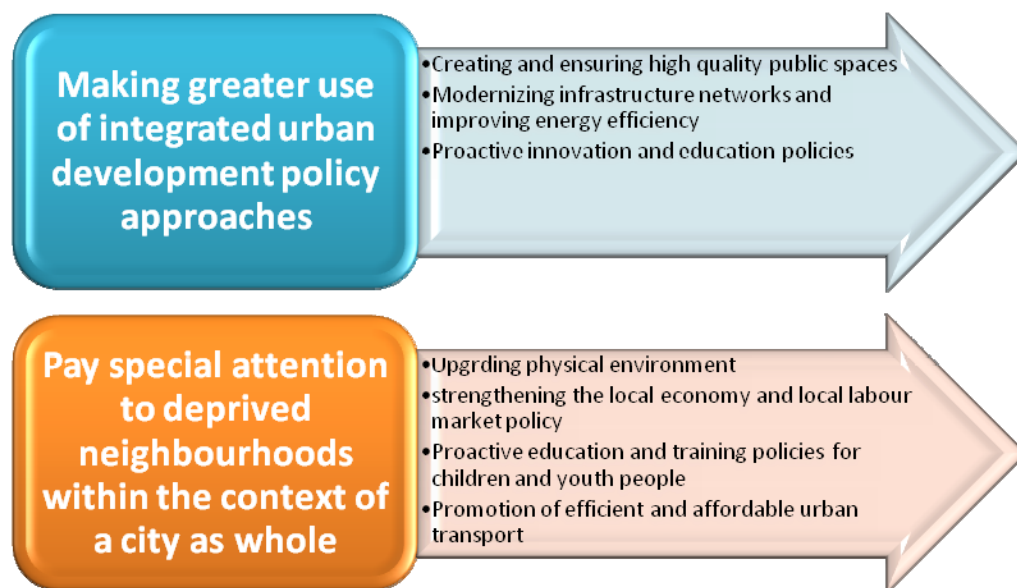
Integrated urban policies were defined in the Leipzig Charter on Sustainable European Cities. The central message in the Leipzig Charter is the necessity of 'integrated strategies and coordinated action' based on the three pillars of sustainability (environmental, economic and social).

The necessity of an integral approach imposes requirements on the institutional setting in which the (European) large cities policy is enacted. All levels of government – local, regional, national and European – have an interest in healthy cities and share the responsibility for the success of cities. The main priorities of Leipzig Charter are the following:

- Europe must draw up a general framework in which urban policy can be enacted. European structural funds must be made available for local projects that embrace this integral approach. In addition, Europe can play a major role in stimulating and facilitating the exchange of knowledge between cities.
- At a national level, the departments involved must work together better and financing sources for urban developments can best be combined.
- European cities (and metropolitan regions) must draw up integral development plans. It is up to the local governments to co-ordinate the implementation of these plans. National, local and regional governments must be involved in drawing up the plans, as well as interested individual citizens and private organizations. In endorsement of the Bristol Accord, the Leipzig Charter emphasizes repeatedly that the skills must be developed at local level by all the parties involved, to enable them to play their role with verve.

The main strategies should be followed in the context of urban development are presented into the following Illustration:

Illustration 1: Strategies of Integrated Urban Development



An alternative explanation was given, during the preparatory meetings for the URBAN-21 Conference (Berlin, July 2000), in order to define **Sustainable Urban Development**:

*“Improving the quality of life in **a city**, including ecological, cultural, political, institutional, social and economic components without leaving a burden on the future generations.”*

Taking a more integrated view by incorporating urban development in the wider context of sustainable development, it is apparent that integrated urban development essentially stresses the importance of integration among the three core aspects of sustainable development that is the environmental, economic and social aspect. Urban development strategies pursue to achieve a balanced growth ensuring that natural resources will be utilized promptly, economic prosperity will prevail and social capital will flourish by reducing disparities and enhancing social values, institutions and governance structures.

1.2.2 Energy Efficiency and Sustainable Urban Development

Efficient energy use, sometimes simply called energy efficiency, is: “*using **less energy** to provide the same level of energy service*”.

An example would be insulating a home to use less heating and cooling energy to achieve the same temperature. Another example would be installing fluorescent

lights and/or skylights instead of incandescent lights to attain the same level of illumination.

Especially, a **sustainable building**, or “green” building is an outcome of a design which focuses on increasing the efficiency of resource use — energy, water, and materials — while reducing building impacts on human health and the environment during the building's lifecycle, through better planning, design, construction, operation, maintenance, and removal.

More specifically, cities are the largest contributor to **energy consumption** and climate change. The world's 20 megacities alone, each with a population exceeding 10 million, are responsible for 75 percent of the planet's energy use. With their populations on the rise—according to the United Nations, 60 percent of the world will live in cities by 2030—cities are experiencing considerable increases in energy consumption.

Bearing these in mind, it is clear that energy efficiency measures constitute an indispensable component of sustainable urban development. Indeed, EU policies stress the importance of energy efficiency measures at national and local level pursuing sustainability.

The question, however, is the extent to which Energy efficiency measures, when undertaken, fulfil directly, or indirectly, the three pillars of sustainable development, comprising at stand alone level an integrated urban development plan themselves. For this purpose an evaluation matrix is developed, which correlates the benefits that energy efficiency measures bring up, with the three pillars of sustainable development.

The benefits of the Energy Efficiency measures are related to the following:

- **Reduction of the Energy Cost:** The main advantage of using energy more efficiently is saving costs, thereby improving the quality of life at citizens' level and improving competitiveness at enterprise level.

A building normally lasts 50-100 years or more. Therefore, it makes a lot of sense to make buildings as energy-efficient as possible from the beginning. The energy prices have risen dramatically in the past years and probably will never go back to the low price level that the world has got used to. By choosing a low energy building or by improving an existing building energy-wise, building owners can keep their energy costs under control and become less vulnerable to future fluctuations of energy prices.

- **Impact on Climate Change:** Energy saving contributes to reduction of CO₂ emissions, while at the same time utilization of RES contributes to more efficient use of natural resources. Cities must be on the front line in the fight against climate change. EU leaders endorsed this vision in March 2007. They committed the EU to cutting its greenhouse gas emissions by 20% of 1990 levels by 2020 provided other developed countries commit to making comparable reductions under a global agreement. And to start transforming Europe into a highly energy-efficient, low-carbon economy, they committed to cutting emissions by at least 20% independently of what other countries decide to do. To underpin these commitments, EU leaders set three key targets to be met by 2020: a 20% reduction in energy consumption compared with projected trends; an increase to 20% in renewable energies' share of total energy consumption; and an increase to 10% in the share of fuel consumption from sustainably-produced biofuels. This kind of impact on the environment has also an indirect economic impact, since what is called “natural capital” is more efficiently utilized, thereby enabling the efficient use of natural resources.
- **Impact on Energy Supply:** Most contemporary energy policies seek to achieve systematic ongoing incremental increases in consumer energy efficiency, since this contributes to improved security of supply. Indeed, energy efficiency is not an alternative to energy security; it is a vital component in achieving it. The European Union currently imports 50% of its energy and estimates this will rise to 70% in the next two decades if no further action is taken. The EU's economic stability and prosperity will therefore be increasingly dependent on the political and economic strategies of its suppliers, and vulnerable to both.
- **Impact on Competitiveness of the Energy Sector:** The improvement of Competitiveness of the energy sector is related to: (i) ensuring that energy market opening brings benefits to consumers and to the economy as a whole, while stimulating investment in clean energy production and energy efficiency, thereby boosting employment (ii) mitigating the impact of higher international energy prices on the EU economy and its citizens and (iii) keeping Europe at the cutting edge of energy technologies. An effective energy efficiency policy does not mean reducing competitiveness. In fact an effective policy in this area means the opposite; making cost-effective investments in order to reduce the waste of energy, thereby increasing standards of living and saving money, and using price signals, that would lead to more responsible, economical and rational use of energy.

- **Improvement of the Public and Occupant Health of End Energy Users – Citizens:** Increasing energy efficiency reduces the harm to public health and the environment from air and water pollution, mining, and other aspects of power production. It is characteristic of low energy consuming buildings erected by modern principles that the indoor climate is significantly better than the indoor climate in traditional buildings. The good indoor climate is documented e.g. in a study of a residential area with 32 passive houses in the German area Kronsberg near Hannover. It shows that the vast majority, 96 % of the residents find the air quality in their home either good (50 %) or very good (46 %) (Agentur für Umweltkonzept, 2001). This is due to the fact that the well-insulated home does not allow draughts while the use of automatic ventilation provide fresh air indoor by changing the air frequently. As a result of the good indoor climate, people become sick less frequently, and their efficiency and productivity is enhanced. In this way, billions of euros can be saved by investing in a good indoor climate.
- A coordinated systematic undertaking of energy efficiency measures **boosts local economies** through private and public investment in buildings, machinery, renewable technologies etc, thereby enhancing economic activity, job creation and local development.
- Establishment of **modern governance structures and methods** through the sensitization of stakeholders regarding the necessity of rational energy use.

The following figure summarizes the above in a comparative matrix where the vertical axis recap the benefits arisen from energy efficiency measures, while the horizontal axis points out the core elements of sustainable urban development. The purpose of the matrix is to illustrate the kind of impact (direct or indirect) of energy efficiency benefits on each aspect of sustainable urban development.

Illustration 2: Comparative Matrix between Energy Efficiency Benefits & Sustainable Urban Development Aspects

		Sustainable Urban Development		
		<i>Environmental</i>	<i>Economic</i>	<i>Social</i>
Energy Efficiency Benefits	Reduction of Energy Cost		✓	☒
	Impact on Climate Change	✓	☒	
	Impact on the Security of Energy Supply		✓	☒
	Impact on Competitiveness of the Energy Sector		✓	☒
	Improvement of the public and Occupant Health of Final Energy Users - Citizens		☒	✓
	Boosting local economies		✓	☒
	Improvement of governance structures and methods			✓

✓ Direct ☒ indirect

The above matrix illustrates clearly the direct and indirect interrelationships between energy efficiency benefits and sustainable urban development. According to this analysis, energy efficiency measures, may contribute significantly to all aspects of sustainable urban development, leading us to the conclusion that when undertaken properly and in an integrated way, they constitute a stand alone integrated urban development plan.

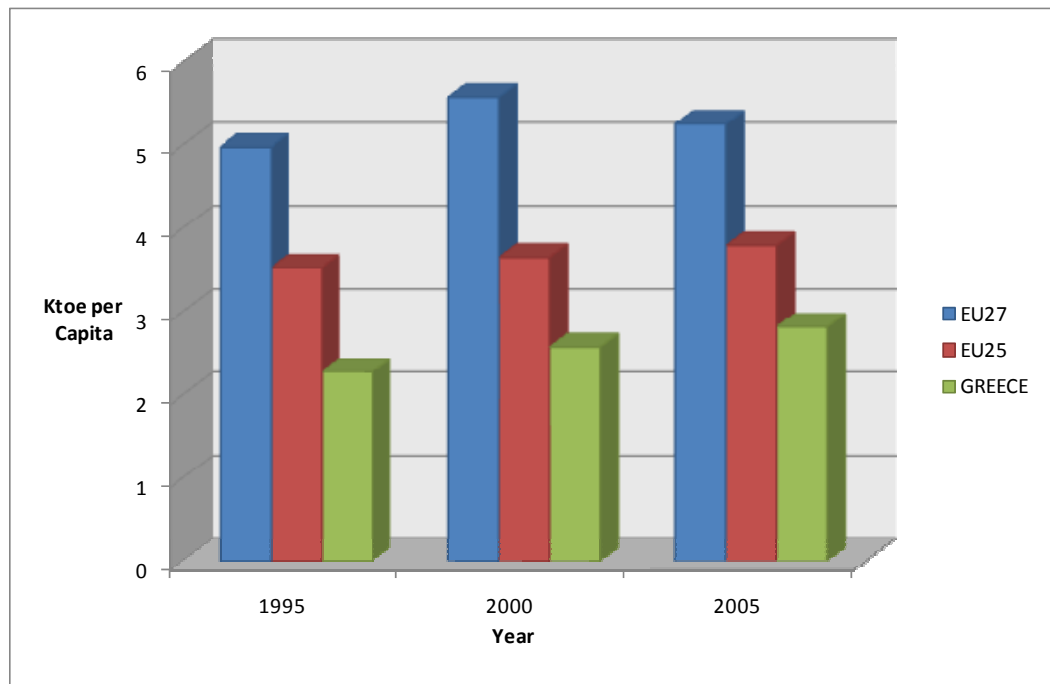
1.3 Energy Trends

1.3.1 Structural Characteristics of Energy Consumption in Greece

Greece consumed in 2007 approximately 33.108 thousand tons of oil equivalent. The average annual increase of energy consumption for the period 1996-2007 was 2,5%.

Average per capita consumption is much lower than the European Average since in 2005 the per capita consumption was 2,82 Ktoe, while the EU 27 average was 5,26 Ktoe.

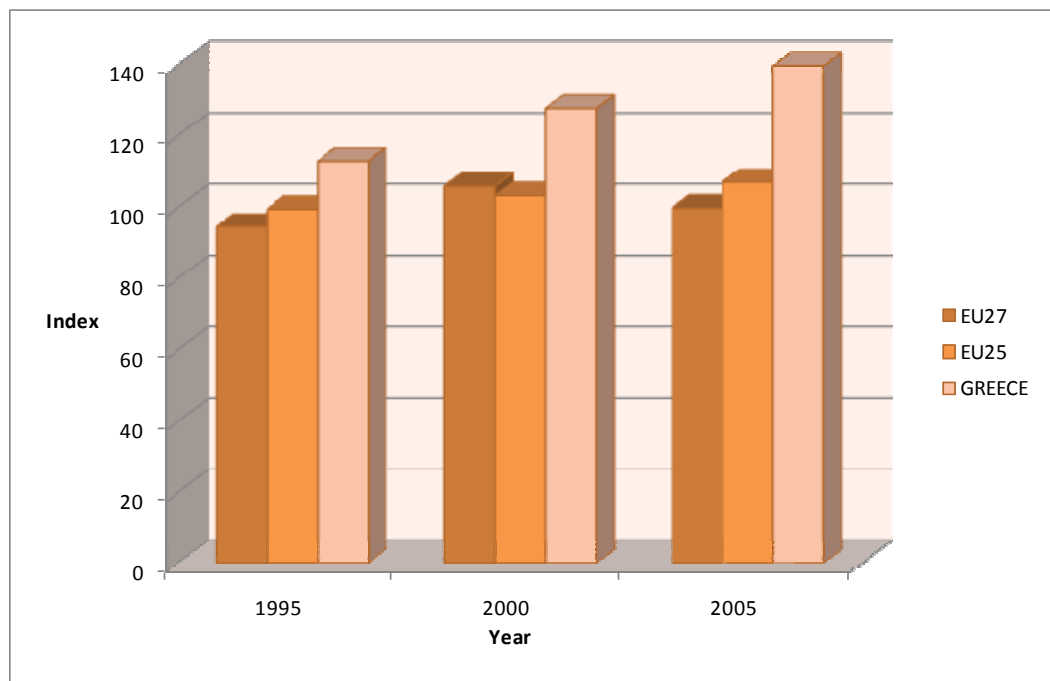
Figure 1: Per Capita Consumption of Energy (Ktoe per Capita)



Source: Eurostat

However, in terms of evolution, Greece is placed above the European average since the index in 2005 rises to 139,5, while the European average declines to 99,7.

Figure 2: Evolution of Energy Consumption per Capita (index 1990=100)



Source: Eurostat

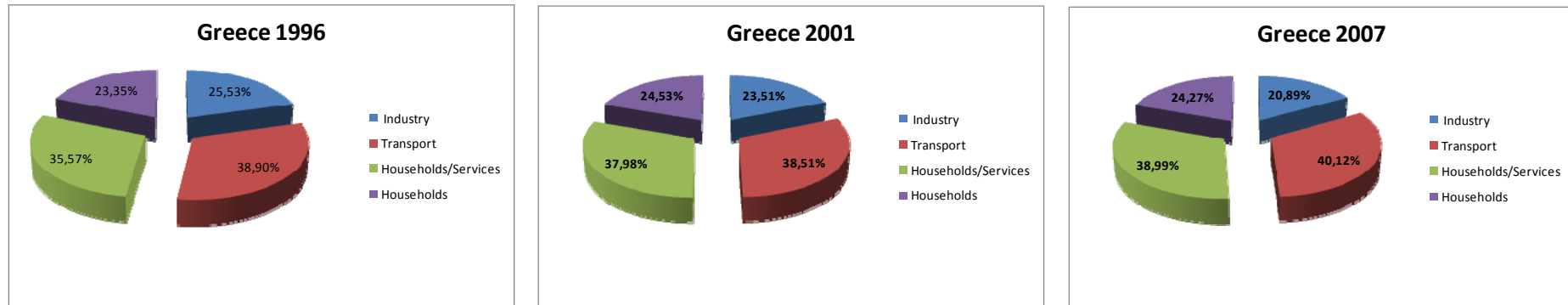
In terms of structure of energy consumption in Greece, households comprise approximately 24% of total consumption, indicating a small increasing trend while when combined with services comprise 39% of total energy consumption. Industry

comprises 20,9% of total energy consumption indicating a significant decrease since 1996, while transport comprises 40,1% of total energy consumption indicating growing trends since 1996.

When compared the above data with EU 27 average, it is obvious that Greece follows the overall trend of declining energy consumption in the industry and the rising consumption in transport. However, while in Greece the energy consumption of households / services is rising, in European Union it illustrates declining trends.

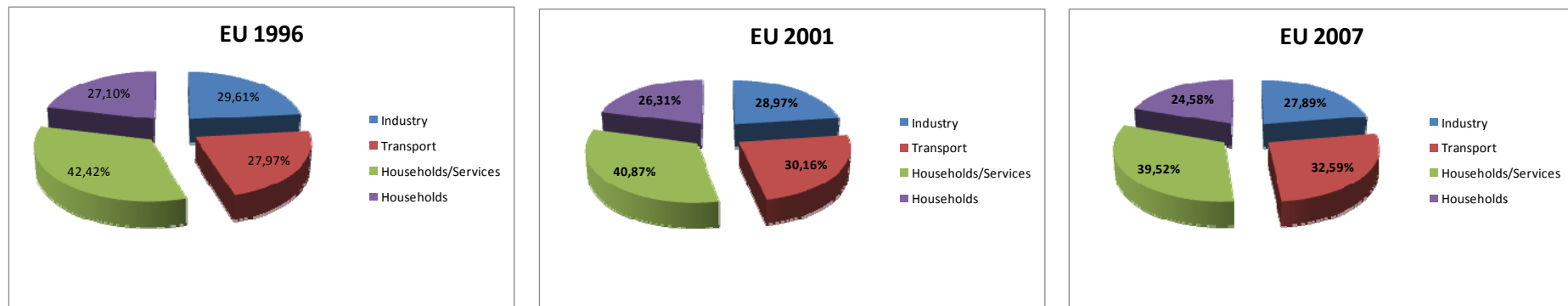
The following graphs illustrate the structure of total energy consumption in Greece and in EU 27 for the period 1996 – 2007

Figure 3: Structure of Energy Consumption in Greece¹



Source: Eurostat

Figure 4: Structure of Energy Consumption in EU 27



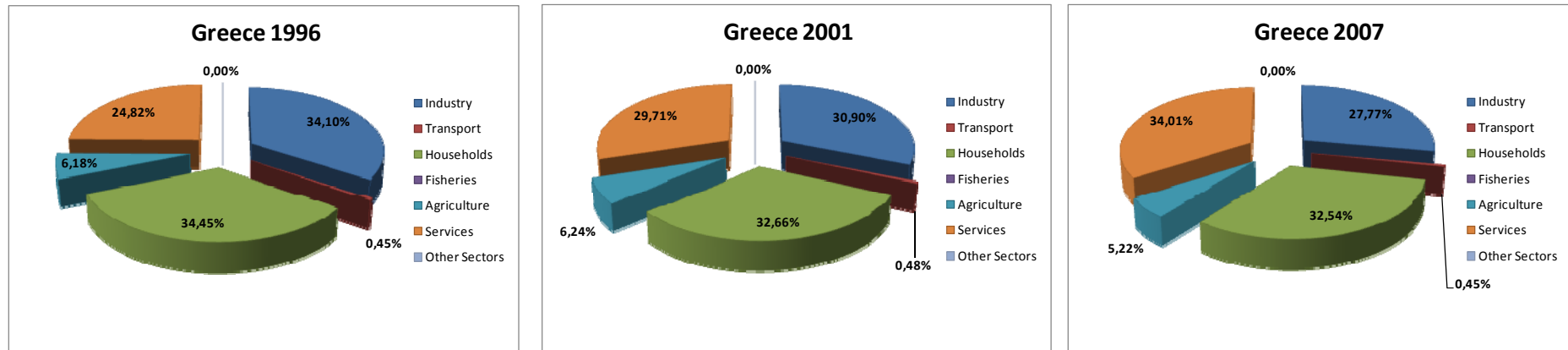
Source: Eurostat

¹ The sums of percentages in the charts are not equal to 100% because households are double counted. If we sum up the categories “industry”, “transport” and “Households/Services” the result is 100%.

In terms of structure of **electricity** consumption in Greece, households and services consume more than two thirds of total energy consumption, while the industry is the second largest electric power consumer in Greece. More specifically, in 1996 total electricity consumption in Greece was 35.562 GWh, 59% of which was consumed by households / services while 34% was consumed by the industry. In 2007, the total energy consumed was 55.191 GWh, 66% of which was consumed by households / services and 27,8% was consumed by the industry. It is worth to be mentioned that service sector, since 1996, was transformed to a major electricity consumer while the industry was moved to the third position (following also households). It is obvious (see also the following graphs) that the electricity consumption model of the country was radically transformed, which is basically justified by the increasing role of the service sector to the overall economy. Instead, the EU 27 electricity consumption model remains relatively stable (in terms of structure) illustrating a slight increase in service sector's participation.

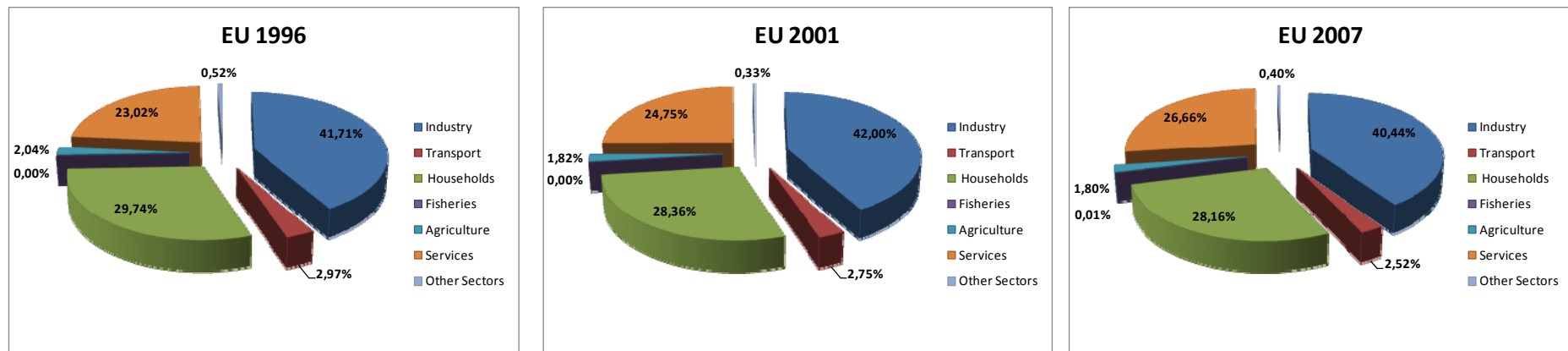
The following graphs illustrate the evolution of electricity consumption's structure in Greece and in EU 27 the period 1996-2007:

Figure 5: Structure of Electricity Consumption in Greece



Source: Eurostat

Figure 6: Structure of Electricity Consumption in EU 27

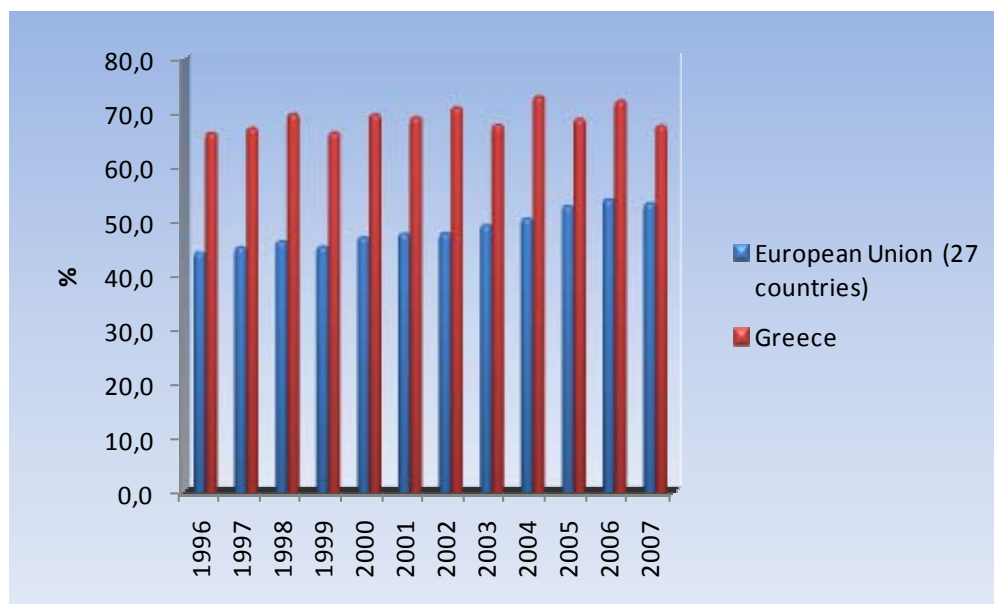


Source: Eurostat

1.3.2 Infrastructure – Energy Capacity in Greece

Greek economy relies very much on imports in order to meet its energy needs. The relevant indicator as measured by Eurostat, (net imports divided by the sum of gross inland energy consumption plus bunkers) shows clearly this kind of dependency, as illustrated by the following graph:

Figure 7 : Energy Dependency of Greece & EU

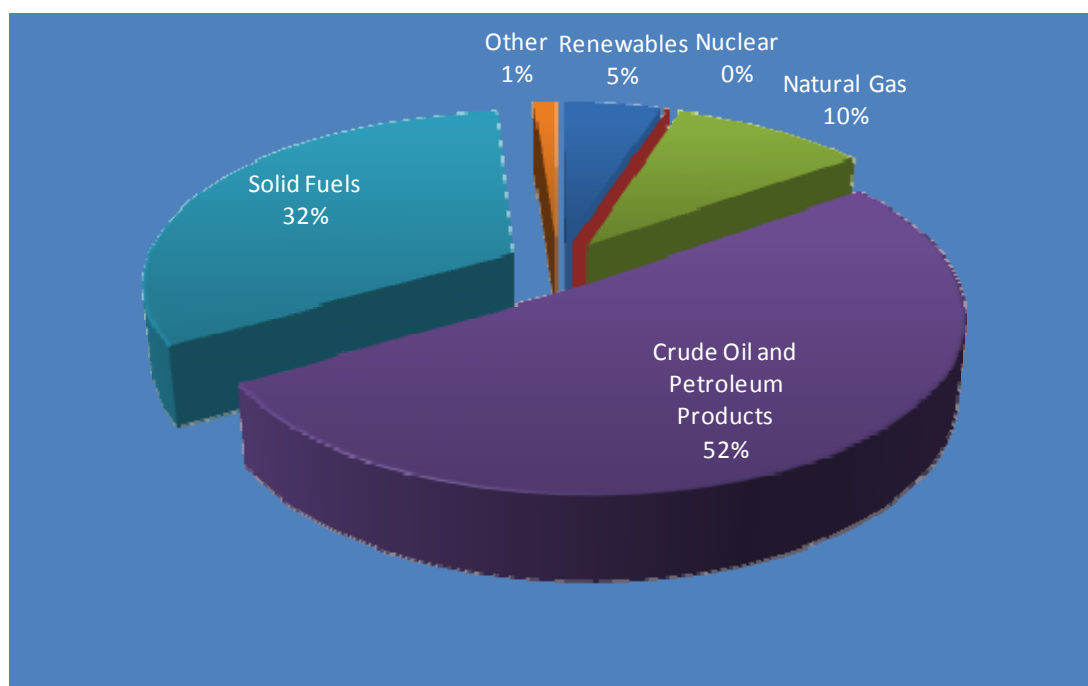


Source: Eurostat

The average degree of dependency on energy imports for the period 1996-2007 is 68,8% while the relative number for European Union 27 is 48.4%, thereby illustrating the structural weakness of Greece to be relied on “traditional” energy resources such as oil and lignite.

This is also confirmed by watching the structure of energy consumption by fuel, where petroleum products and solid fuels comprise 83.8% of total gross inland consumption.

Figure 8: Structure of Gross Inland Consumption by Fuel (2007)



Source: Eurostat

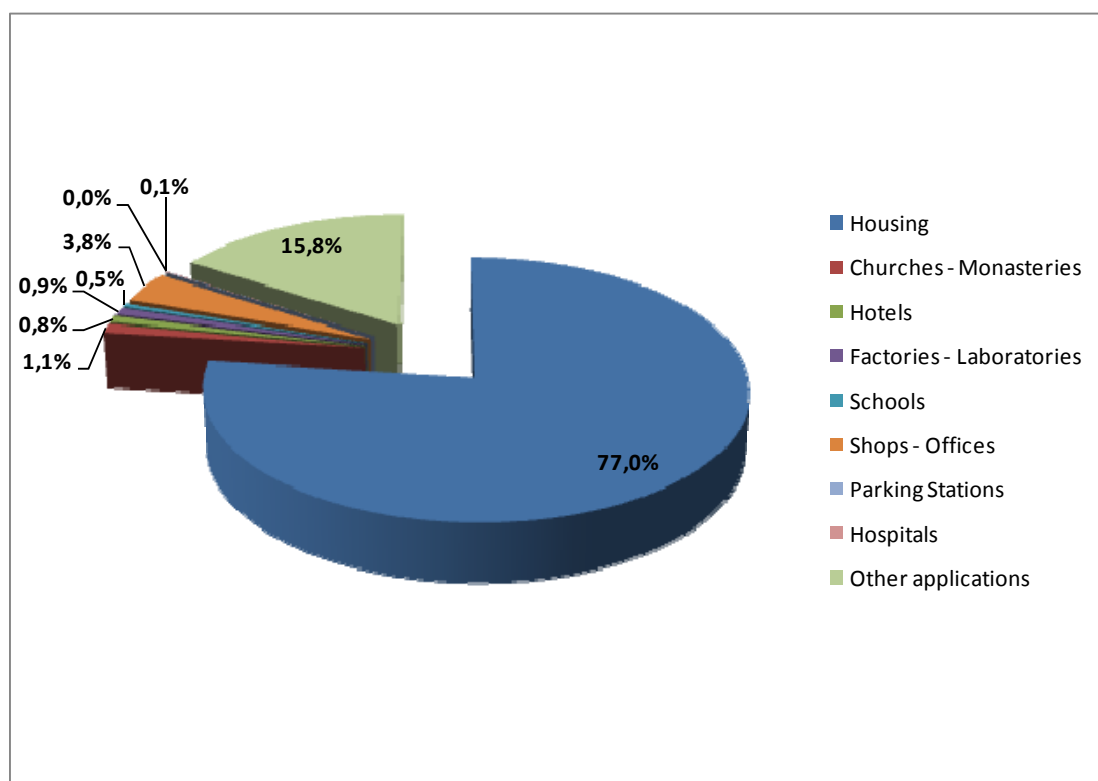
The share of renewable energy sources in gross inland energy consumption is approximately 5%, while it does not illustrate significant increases within the period 1996-2007 (the share of RES varies from 4,9% to 5,7%).

Additionally, combined heat and power generation systems have not been developed sufficiently in Greece, since the share of such systems in total energy generation ranges from 1,5% to 1,7% (for the period 2004-2007) while the relative measure for EU 27 (for the same period) ranges from 10.5% to 11.1% (source: Eurostat).

1.3.3 Buildings

The total number of buildings according to the last census (2000) was 3.990.970. The vast majority (77%) consists of dwellings, while 3,8% consists of shops and offices. The following graph illustrates the composition of buildings in Greece.

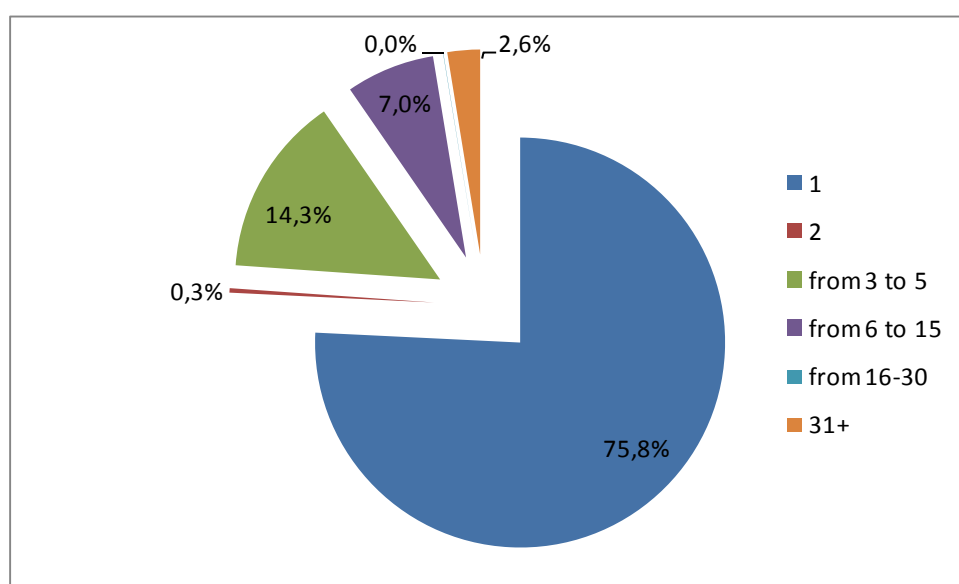
Figure 9: Composition of Building in Greece



Source: Hellenic Statistical Service (Buildings Census (2000))

The large proportion of residential buildings (75.8%) are one family dwellings and 14,3% are two families buildings. The following figure illustrates the composition of residential buildings in terms of the number of households :

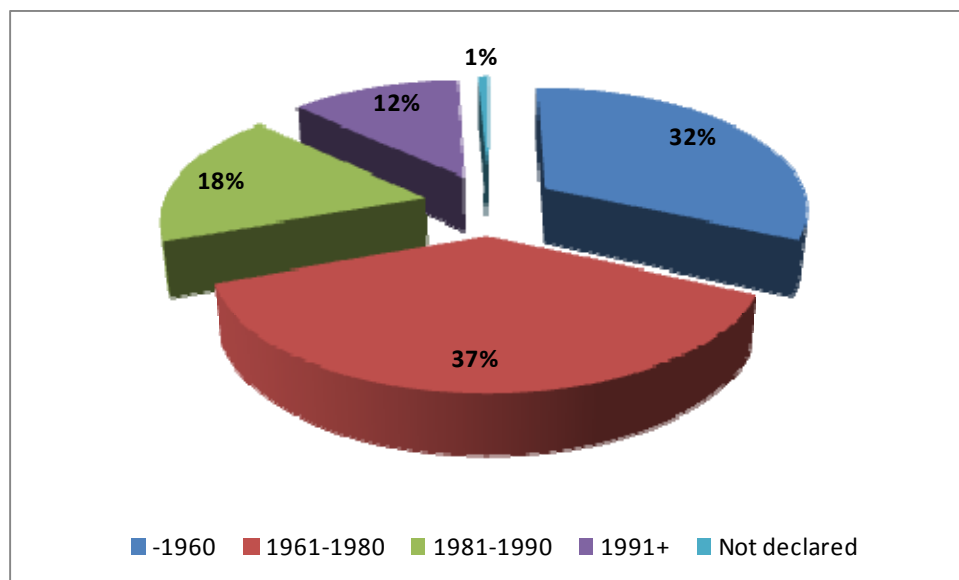
Figure 10: Composition of Residential Buildings in terms of the number of households in Greece



Source: Hellenic Statistical Service (Buildings Census (2000))

Additionally, the vast majority of existing buildings were constructed before 1980. More particularly 69% of the buildings existing in Greece were constructed before 1980, and 29% were constructed after 1980.

Figure 11: Age of buildings in Greece



Source: Hellenic Statistical Service (Buildings Census 2000)

The year 1980 constitutes a major threshold since in 1980 the new thermo-insulation regulation was put into force. According to Hellenic Ministry of Development's estimations, only 30% of the houses are thermo-insulated, while the age of the buildings, combined with the lack of environmental design, rank them among the least efficient buildings in Europe (source: Ministry of Development).

Indicatively, the average electricity consumption per dwelling in Greece is approximately 16,8% higher than the EU 27 average while the relative energy consumption for space heating is approximately 20% lower. However, although Greece consumes less energy for heating than the EU average, it is one of the few countries (Bulgaria, Croatia and Italy) that illustrate increase in heating consumption. More particularly, the average heating consumption per m² in 1997 was 115 Kwh, while in 2007 it was 132 Kwh.

Table 1: Energy Consumption per Dwelling

Total Consumption per dwelling

Country	Unit	1990	1995	2000	2002	2003	2004	2005	2006	2007
Greece	toe/dw	1.00	0.98	1.24	1.36	1.32	1.38	1.38	1.33	1.39
EU15	toe/dw	1.72	1.65	1.72	1.71	1.70	1.69	1.67	1.69	n.a.
EU27	toe/dw	1.65	1.61	1.67	1.66	1.64	1.63	1.61	1.62	1.54

Consumption per dwelling for lighting & electrical appliances

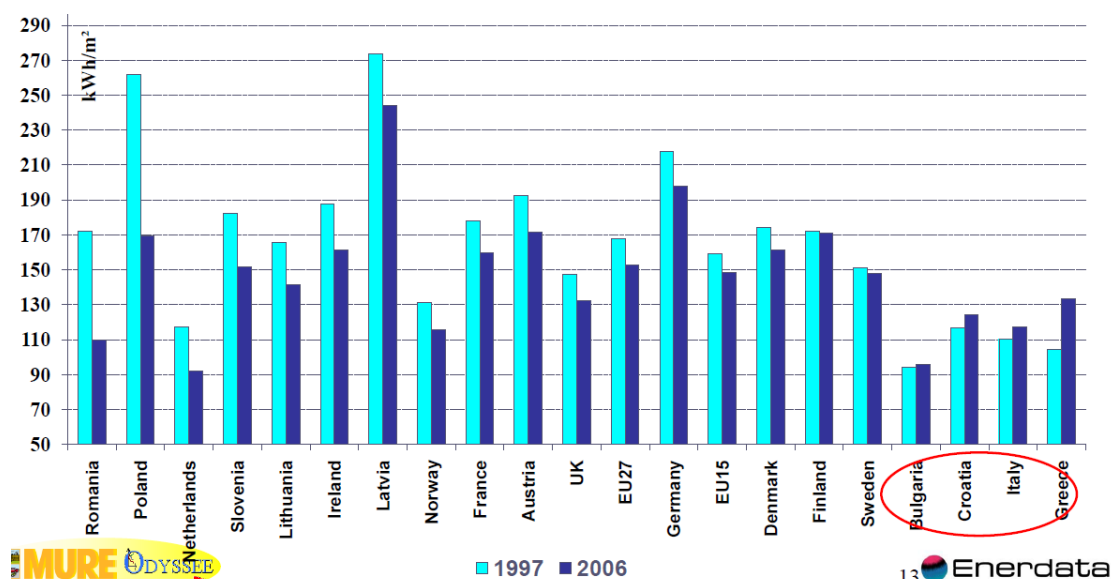
Country	Unit	1990	1995	2000	2002	2003	2004	2005	2006	2007
Greece	kWh/dw	1230	1607	2318	2523	2688	2771	2820	2926	2960
EU15	kWh/dw	2212	2353	2496	2569	2623	2643	2699	2692	n.a.
EU27	kWh/dw	2062	2173	2301	2361	2418	2440	2493	2503	n.a.

Consumption per dwelling for space heating

Country	Unit	1990	1995	2000	2002	2003	2004	2005	2006	2007
Greece	toe/dw	0.76	0.66	0.87	0.97	0.91	0.96	0.98	0.91	0.96
EU15	toe/dw	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
EU27	toe/dw	1.18	1.12	1.18	1.15	1.12	1.11	1.10	1.11	n.a.

Source: ODYSSEE – Energy Efficiency Indicators in Europe

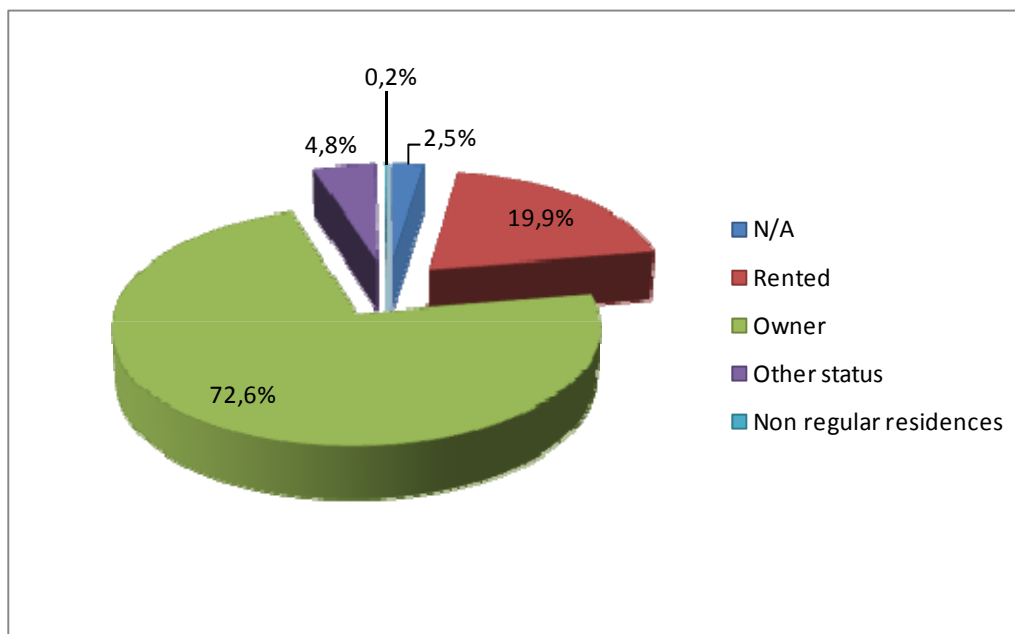
Figure 12: Average Energy Consumption for heating Kwh per / sq meter



Source: ODYSSEE – Energy Efficiency Indicators in Europe

The total surface of Greek dwellings is estimated² to 450 mil m² . As far as the allocation of households between rented and owned dwellings, 19,9% of the households live in rented dwellings while 72,6% of the households live in owned dwellings.

Figure 13: Allocation of Households according to the ownership type of their Dwelling

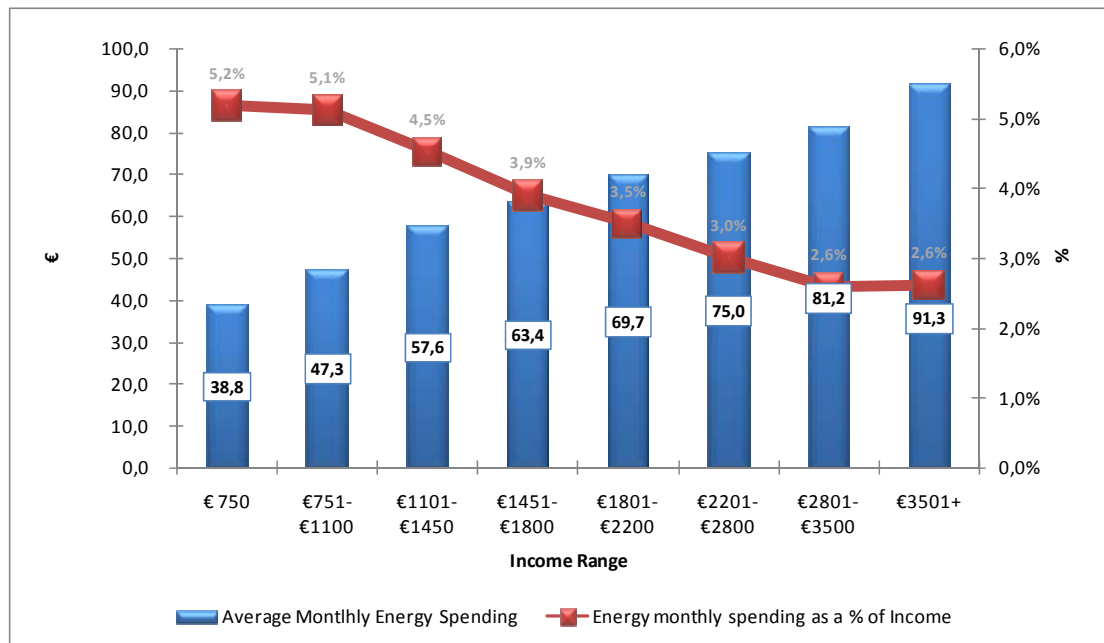


Source: Hellenic Statistical Service

The average electricity consumption per dwelling is estimated to 3.000 Kwh annually (that is 40 Kwh/m²), while the average spending per household for energy related expenditures is €65,26 per month, that is €783,12 annually (source: National Statistics Service 2004). By making an adjustment of the above number to today's prices, the average spending per household would be approximately €926,3 annually. This amount includes electricity bills and fuel consumption for heating. The more the income of the household is increased, the more the average energy spending is increased. However when energy spending is related to the average income (estimated as the average between the low end and the high end of each range) we conclude that the more the average income is increased the lower the participation of energy expenditure in income, as presented into the following figure:

² Total surface of dwellings is not available. Statistical Service provides the number of dwellings as allocated to surface ranges (-49, 50-74, 75-100 etc). In order to estimate the total surface of dwellings we took the average of the minimum and the maximum of the range (and divided by 2) and multiplied by the total number of dwellings included in each particular range.

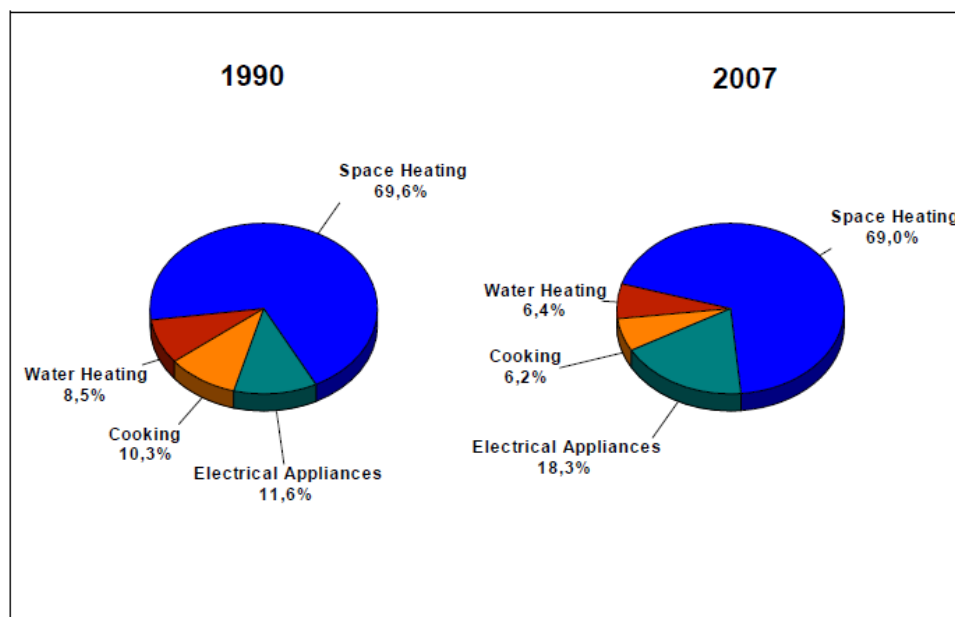
Figure 14: Relationship of Energy Spending and Households' Income



That means that, the less the income of the household the more intensive the need for energy efficiency interventions for supporting low income households.

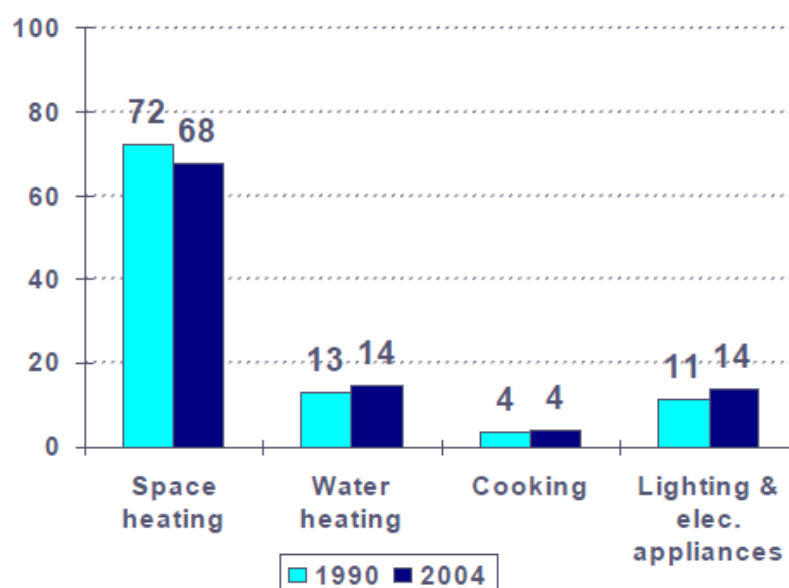
According to the report of the National Council for Energy Strategy (Measures and Means for an Efficient Competitive Energy Policy, Spring 2008) the greatest potential for energy efficiency improvements in the residential sector are in space and water heating and lighting, since these are the most energy consuming categories. The following figures illustrate the allocation of energy consumption in residential buildings amongst the different energy consumption categories in Greece and in EU 15:

Figure 15: Analysis of energy end use in residential sector (1990-2007)



Source: ODYSSEE – Energy Efficiency Indicators in Europe

Figure 16: Analysis of End Energy Use (%) in residential sector (EU 15)



Source: ODYSSEE – Energy Efficiency Indicators in Europe

As far as space heating is concerned, energy savings will be attained by combining measures of thermal insulation, replacement of frames, doors and shutter assemblies, usage of double glazing windows, utilization of natural gas and further penetration of district heating. Total saving potential from energy efficiency measures

related to space heating are estimated to reach **3,142 Twh** in 2016. According to the report 60% of these savings will be attained by measures of insulation and double glazing windows.

Energy savings related to water heating will be attained by installing solar systems on buildings' roofs, combined with the penetration of district heating systems and natural gas. Total saving potential from energy efficiency measures related to water heating are estimated to **1,298 Twh** in 2016. According to the report 99% of these savings will be attained by the installation of solar systems on buildings' roofs.

Finally, the energy savings related to lighting will be attained by replacing old incandescent lamps by fluorescent lamps. Total saving potential from energy efficiency measures related to lighting are estimated to reach **0,5 Twh** in 2016.

The following table summarizes the annual saving potential in residential sector:

Table 2: Energy Saving Potential in Residential Sector until 2016

	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cooking	0	0	13	20	27	33	39	44	49
Dish Washing	0	24	52	71	76	75	74	73	73
Water heating	31	253	628	690	828	964	1.116	1.276	1.298
Washing Machines	0	47	98	132	144	153	152	151	149
Lighting	18	106	207	302	392	425	453	477	499
Freezing	27	67	109	153	182	177	172	167	163
Air conditioning	20	40	69	97	126	136	146	156	161
Space Heating	56	276	503	706	1.200	1.696	2.185	2.737	3.142
Total	152	814	1.679	2.171	2.974	3.659	4.337	5.082	5.533

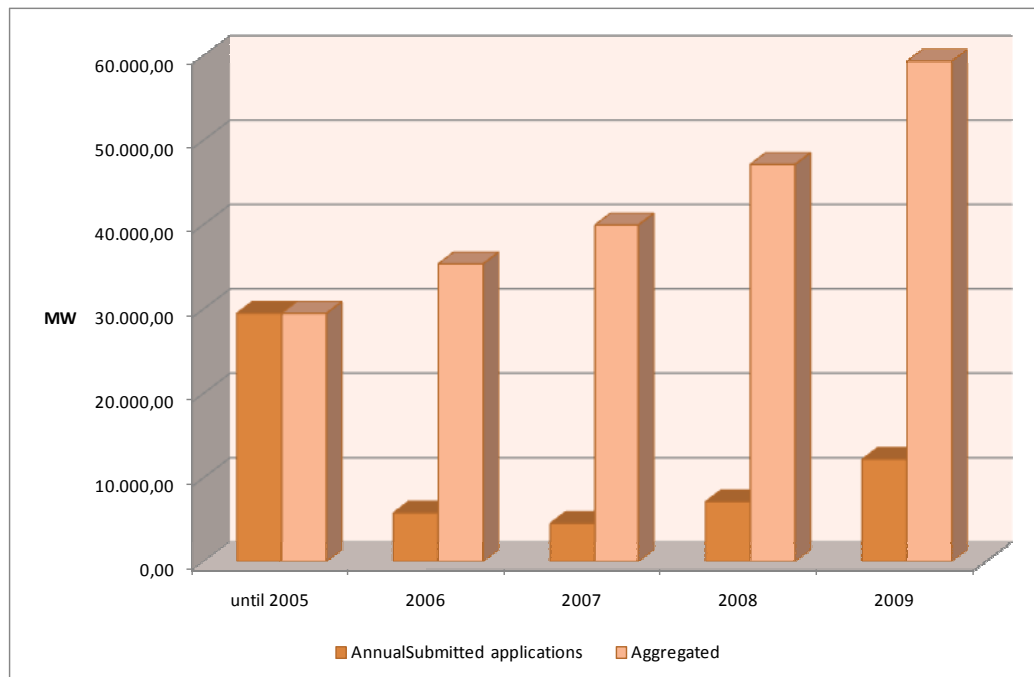
Source: National Council for Energy Strategy, Report for the Measures and Means for an Efficient Competitive Energy Policy, Spring 2008

1.4 Renewable Energy Sources – Recent Trends & Developments

Installed capacity of RES in 2008 approached 4.300 MW, while total electricity generation from RES reached 4.530 Gwh. The objective for 2010 (20% participation of RES in total electricity production) does not seem to be feasible. This uncertainty is mostly related to radical delays in licensing procedures and problems incurred to the connection of wind parks with the main electricity network.

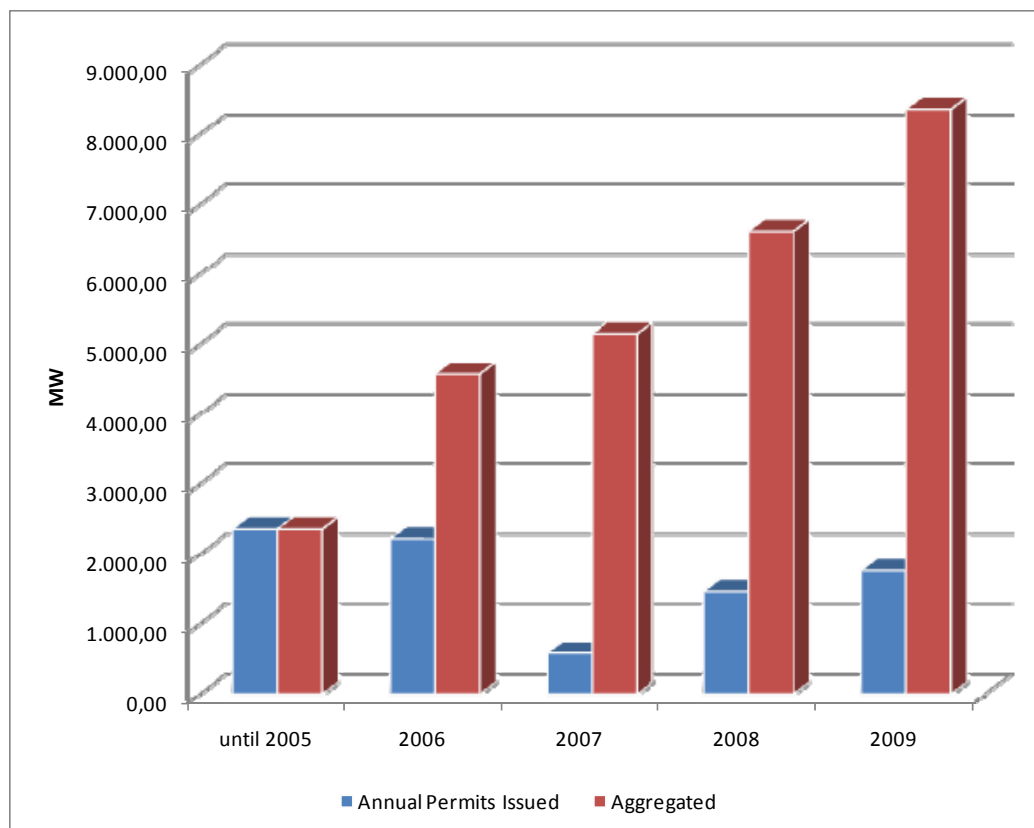
Despite some improvements occurred concerning the legislative framework of RES, the potential of the market seem to be overestimated since the total power of applications for electricity generation permits, exceeds by far the realistic capacity of the country in terms of distribution network capabilities and the overall demand. More particularly, total applications for RES reached in 2009 59.350 MW, while the total permits provided are for 8.352,3 MW.

Figure 17: Total Power of RES Applications Submitted for Permit³



Source: Regulatory Authority of Energy - Data Processing

Figure 18: Total Power of RES Permits Provided



Source: Regulatory Authority of Energy – Data processing

³ Includes wind, photovoltaic, biomass, geothermal, hydroelectric and hybrid stations

In 2009, the total power of applications approved, and being provided a permit for proceeding to the relevant investments, is 8.352,3 MW of which approximately half (4.300 MW) have been installed and are operating. Therefore, the relative ratios compared to the number of applications submitted are:

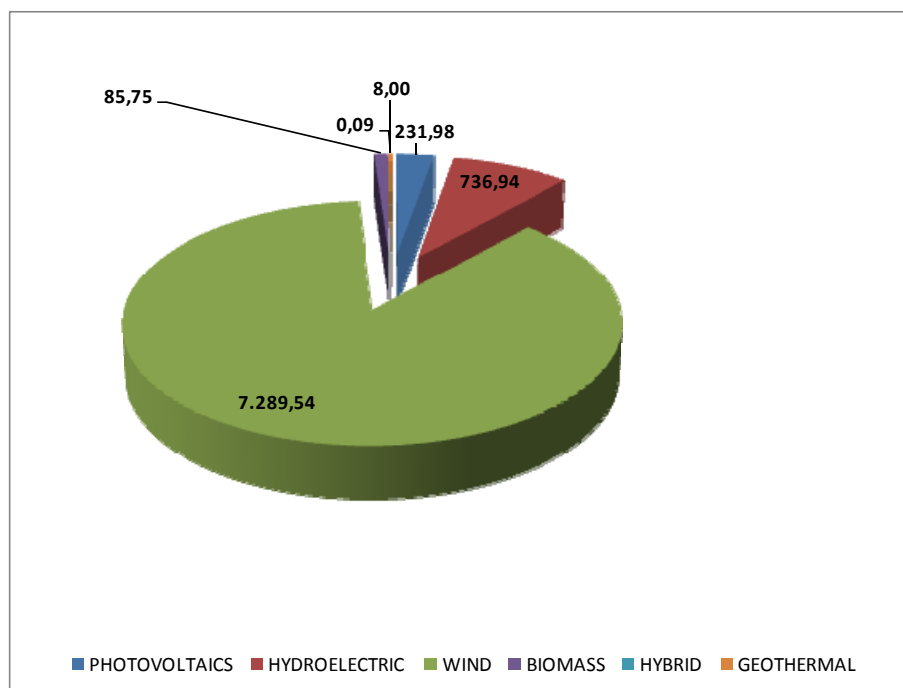
$$\frac{MWofRESpermitsIssued}{MWofRESApplications} = \frac{8.352,3}{59.350} = 14,1\%$$

$$\frac{MWofRESInstalledCapacity}{MWofRESApplications} = \frac{4.300}{59.350} = 7,2\%$$

It is true that the legislative framework regarding RES (L. 3468/2006), has not taken into consideration the excess demand that would be created, resulting to major delays in evaluating the applications due to lack of the appropriate evaluation mechanism and due to lack of complementary legislation regarding environmental and spatial implications of such investments. The new legislative framework amending the L.3468/2006, which is under consultation, is expected to reduce radically the time required to obtain a permit from 3-5 years to approximately 10 months (see also concluding remarks of the Case Study)

The allocation of existing RES permits according to the technology used is the following:

Figure 19: Allocation of Existing and Future RES Facilities According to the Technology used (MW)



Source: Regulatory Authority of Energy – Data processing

Finally, a complementary note should be made regarding District Heating in Greece. The first district heating stations have been established in Kozani and Ptolemaida (North-West Greece) in 1993., by utilizing the disposed heat from thermoelectric stations of PPC (DEI) in Ptolemaida. Nowadays there are 4 district heating stations in Kozani, Ptolemaida, Amyntaio and Megalopoli. All these cities are very closed to thermoelectric stations of PPC and utilize the disposed energy from PPC's generation facilities. The development of district heating systems is not very popular in Greece because of the mild climate. However, the climate of North-West Greece, which is similar to central Europe's climate, combined with the fact that in this area there are 4 generation facilities of total capacity 4.108 MW, favor the establishment of such systems. This is the reason that there is another district heating system to be constructed in the area (Florina) of total capacity 70MWth and a smaller system (2 MWth) in Pieria.

The following table summarizes the main characteristics of the existing district heating systems in Greece:

City	Area	Initiation Year	Capacity	Households covered	Remarks
Kozani	NW Greece	1993	140 MWth	24.000	To be further upgraded
Ptolemaida	NW Greece	1993	75 MWth	11.515	
Amyntaio	NW Greece	2001	25 MWth	9.800	Potential to upgrade to 40 MWth
Megalopoli	Peloponnesus	Not operating yet	17 MWth	-	-

1.5 Population's Financial Status

The main findings of the study performed by the Central Bank of Greece⁴ regarding the indebtedness of the population in 2007 (May 2008) were the following:

1. More than half of the population (51,4%) declared that they have a debt, while the relative measure in 2005 was 46,9%.
2. The most widespread form of debt was credit cards followed by mortgages. In

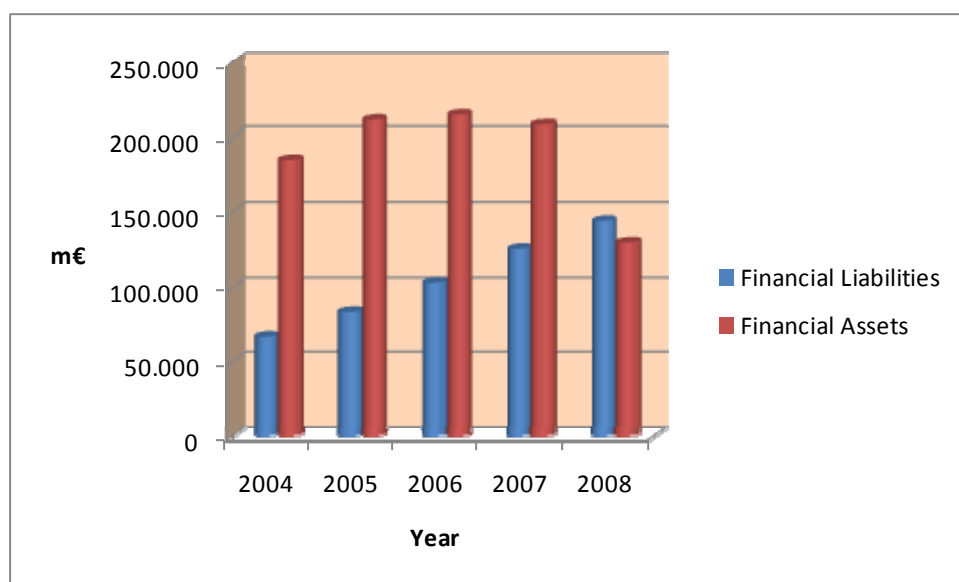
⁴ Debt and leverage pressures to Greek Households, Central bank of Greece, Statistics Directorate, May 2008

both cases the size of the population carrying a debt is increased if compared to the relative measures of 2005. Especially in the case of credit cards, approximately 2/3 of the population declare that they carry liabilities from credit cards.

3. The average debt per household is directly related to average income. The more the income is increased the higher the amount of debt. Credit policies of banking institutions have been reoriented towards a safer credit risk management by attracting clientele of higher income.
4. For the vast majority of households (84%) the quotient of loan service payments divided by the income was at affordable levels (approximately 40%) despite a small deterioration compared to 2005, which is justified by the increase of interest rates. However, for 16% of households the annual cost of debt service payments exceeds 40% of their income, while their share in total debt is relatively high (36,6%) and in most cases regards non mortgage debt.

On the other hand, it seems that the leverage of Greek households is radically increased since total financial liabilities almost doubled from €67,548 billion in 2004 to €144,051 bil in 2008. On the contrary, financial assets of Greek households are radically decreased since the total amount of financial assets in 2004 was €184,8 bil and in 2008 was €130,275 bil.

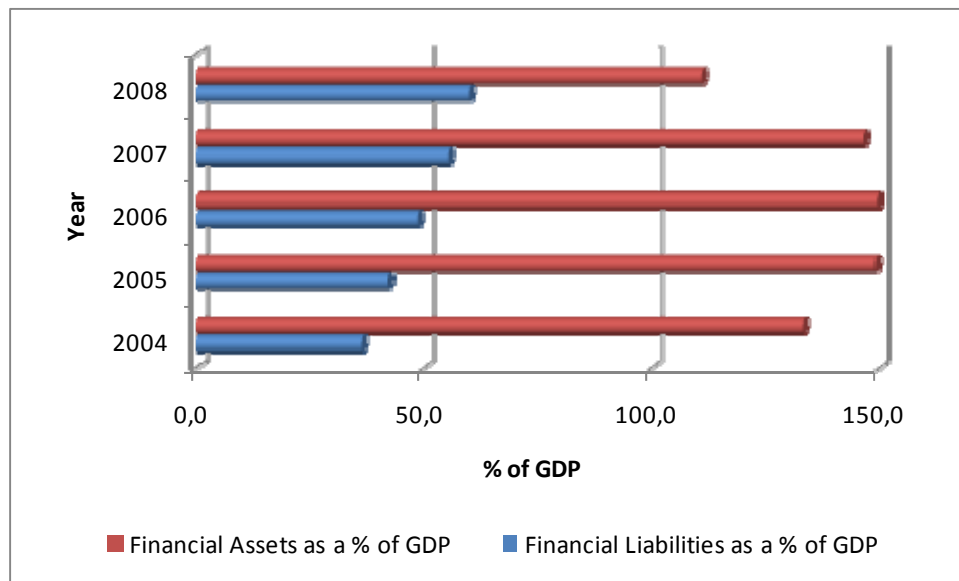
Figure 20: Financial Assets and Liabilities of Greek Households



Source: Central Bank of Greece

Accordingly, financial liabilities of Greek households as a percentage of GDP increased from 36,3% in 2004 to 60% in 2008, whilst financial assets decreased from 133.4% to 111.1%.

Figure 21: Financial Assets & Liabilities of Households as a % of GDP

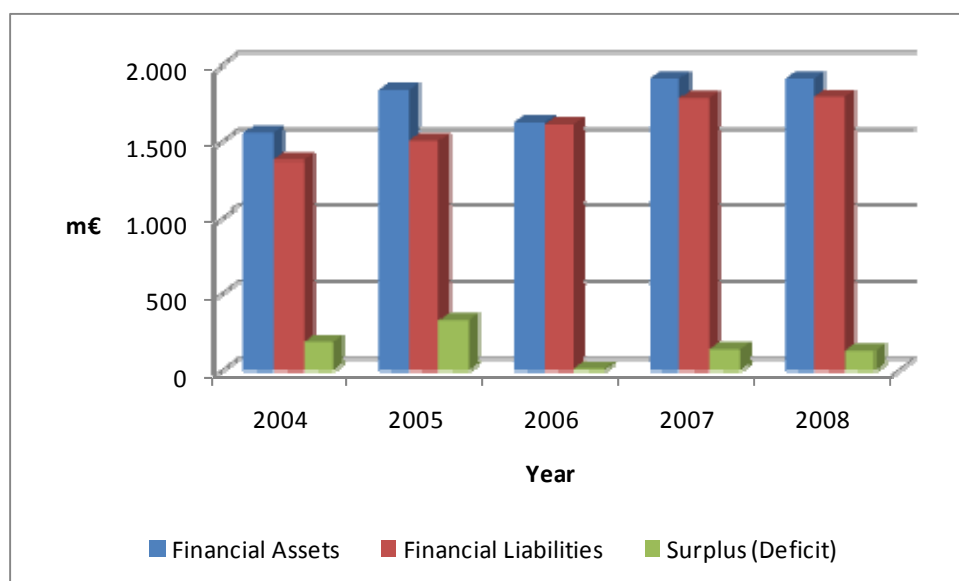


Source: EU Economic Data Pocket Book 1-2009, Eurostat

Although there are no updated information regarding the financial status of population in 2009, it is logical to assume that leverage has been increased due to the economic crisis. Taking also into consideration that financial assets illustrate a rapid decrease it is concluded that the financial status of population is deteriorating, although it is still at affordable levels.

A special reference should also be made to Local Authorities since they constitute a major target group for JESSICA alike initiatives. According to data provided by Central Bank of Greece, it seems that total financial assets exceed financial liabilities, thereby creating a cash surplus of €124 mil (2008). The trend for both, financial assets and liabilities is to increase, while liabilities increase more drastically, thereby reducing the total surplus.

Figure 22: Financial Assets & Liabilities of Municipal Authorities



Source: Central Bank of Greece

In addition, according to discussions we had with the Central Association of Municipalities, the financial condition of Municipalities in 2010 will deteriorate because central government's financing to local authorities will be reduced by €600 mil, compared to 2009.

2 NSRF Mapping

The purpose of this chapter is to provide an integrated picture of the planning environment regarding energy efficiency interventions in the context of Operational Programs of National Strategic Reference Framework.

Analysis is focused on the energy sector, that is thematic priorities 39 – 43 which provide for exploitation of Renewable Energy Sources and Energy Efficiency Measures. The main findings of the analysis per Operational Program are presented into the following paragraphs.

2.1 Operational Program “Competitiveness & Entrepreneurship

The priority axis 4 of O.P “Competitiveness & Entrepreneurship” aims to improve the energy system of the country and to boost sustainability. The programming document provides for various measures to achieve that, including energy efficiency projects addressing public and private buildings as well as enterprises.

The relevant objectives of the OP related to energy efficiency, provide for:

- Total power generated by RES and CHP: **1.279 MW in 2013**
- Annual primary energy savings achieved through investments in RES, CHP and energy efficiency measures: **297,638 ktoe in 2013**

Currently, the priority axis 4 is being activated through the following initiatives

- “EXOIKONOMO” which provides for energy saving activities in municipal buildings, communal areas, municipal transport means, including also activities related to publicity and sensitization of citizens and municipal employees regarding the energy consumption issues.
- “Allazo Klima” (Replace Airconditioning), which provides for replacing old air conditioning equipment by brand-new equipment in households
- “Exoikonomisi Kat’ oikon” (energy conservation in houses), a forthcoming initiative related to energy efficiency measures in private households.

The following paragraphs describe these particular initiatives.

2.1.1 The Initiative EXOIKONOMO

The total budget of the initiative (including public expenditure and Municipalities contribution) is €100 mil. A total amount of €35,105 mil (including public expenditure and own contribution) is provided by the O.P “Competitiveness & Entrepreneurship” in order to finance energy efficiency projects in the 8 regions of the objective 1 (“Convergence”), while the remainder amount of €64,9 mil (including public expenditure and own contribution) is provided by the Regional Operational Programs of the Transitional Support Regions. Public expenditure accounts for 70% of the total budget, that is €70 mil. The amount of €24,573 mil is provided by the OP “Competitiveness & Entrepreneurship” and €45,427 mil is provided by Regional Operational Programs.

The following table summarizes the financing status of the initiative:

Table 3: Financing status of “EXOIKONOMO” Initiative

	Total Budget	Public Expenditure
Operational Program Competitiveness & Entrepreneurship (Objective 1 Regions)	35.105.263,16	24.573.684,21
East Macedonia & Thrace	6.608.049,54	4.625.634,68
West Greece	7.021.052,63	4.914.736,84
Epirus	1.652.012,38	1.156.408,67
Ionian Islands	2.065.015,48	1.445.510,84
Peloponnesus	5.369.040,25	3.758.328,18
Thessaly	5.782.043,34	4.047.430,34

	Total Budget	Public Expenditure
North Aegean Islands	1.239.009,29	867.306,50
Crete	5.369.040,25	3.758.328,18
Regional Operational Programs (Regions in Transition)	64.894.736,84	45.426.315,79
Attica	34.526.315,79	24.168.421,05
Central Greece (Sterea Ellada)	3.631.578,94	2.542.105,26
South Aegean	3.842.105,26	2.689.473,68
Central Macedonia	20.526.315,79	14.368.421,05
West Macedonia	2.368.421,06	1.657.894,74
Grand Total	100.000.000,00	70.000.000,00

Eligible organizations for the submission of proposal, are Municipalities with population over 10.000 inhabitants (based on 2001 census report), which at the same time (at the date of proposal's submission) should be certified for Type A and B⁵ projects, based on the Acts of the National Strategic Reference Framework 2009-2013, or should have submitted a relevant application for certification.

The eligible Municipalities that could submit proposals in the program are divided in the following budget's categories:

- 10.000 - 45.000 inhabitants: € 700.000 (incl VAT)
- 45.000 – 90.000 inhabitants: € 1.000.000 (incl VAT)
- 90.000 – 150.000 inhabitants: € 1.500.000 (incl VAT)
- 150.000 - 300.000 inhabitants: € 3.000.000 (incl VAT)
- >300.000 inhabitants: € 6.000.000 (incl VAT)

Given the real needs of municipalities, and taking also into consideration the case study of Rhodes' Municipality, it seems that the available budget is not sufficient to implement an integrated energy efficiency plan covering the total needs of municipalities. The institutionalization of energy services contracts and third party financing will be the most efficient instrument for implementing integrated energy efficiency plans in this respect.

The program includes integrated interventions for improving energy efficiency in city areas. In particular, the aim of the program is related to the improvement of the energy performance of buildings, the energy saving in public lighting, the bioclimatic design of communal spaces and the energy efficiency in the structured environment. In addition, the program focuses on the improvement of the transportation and urban environment as well as the energy saving in Municipal electromechanical venues.

⁵ Type A projects concern infrastructures, while Type B projects concern services procurement

The Initiative's Intervention Axes are described as follows⁶:

- Axis 1 – Interventions in Municipal Buildings: The eligible activities of Axis 1 refer to energy efficiency interventions in municipal buildings such as city halls, public services buildings, cultural centers, schools, sports venues etc. The expected benefits according to the programming documents are estimated to energy savings of 958 ktoe in municipal buildings and reduction of CO₂ emissions by 4,97 kt annually.
- Axis 2 – Energy Saving in Public Lighting, Bioclimatic Design of Public Spaces, and Energy Efficiency in the Structured Environment: The energy efficiency interventions in communal spaces refer to roads, squares, parks and other communal spaces and in some cases the surroundings of municipal buildings. The expected benefits according to the programming documents are estimated to 483 ktoe in adjacent buildings and reduction of CO₂ emissions by 4,9 kt annually
- Axis 3 – Public Transport: This axis refers to the incorporation of best practices in municipal transport, such as utilization of cleaner fuels, development of urban mobility plans as well transportation surveys. The expected benefits according to the programming documents are estimated to energy savings of 2.910 Ktoe and reduction of CO₂ emissions by 2.891 kt annually
- Axis 4 – Other Municipal Venues: This axis relates to the implementation of low cost interventions for the improvement of energy efficiency of pumping stations, biological purification etc. The expected benefits according to the programming documents are estimated to energy savings of 307 Ktoe and reduction of CO₂ emissions by 3,1 kt annually
- Axis 5 – Dissemination, Awareness and Communication Plan: This axis comprises specific actions referring to publicity-awareness and the enhancement of municipal employees' awareness in relation to the energy monitoring of results stemming from the initiatives' interventions. The expected benefits of this particular axis cannot be estimated. However, according to the programming document, the implementation from eco-driving activities is expected to save approximately 94 ktoe and reduce CO₂ emissions by 0,29 kt annually.
- Axis 6 – Technical Support for the Implementation of the Program: includes consultants' fees, energy inspections and project management

⁶ Potential benefits from the initiative are based on the programming documents and the methodology for estimating them is not reported. Therefore, it is not possible to estimate whether these expected benefits are realistic or not.

compensations.

The maximum budgetary limits per Axis are summarized as follows:

- Axis 1 (Buildings): 55%-65%
- Axis 2 (Public Spaces): 15%-25%
- Axis 3 (Transport): 0-15%
- Axis 4 (Other Municipal Venues): 0-4%
- Axis 5 (Dissemination, Awareness and Communication Plan): 0-4%
- Axis 6 (Technical Support for the Implementation of the Program): 0-10%.

It is noted that, energy savings in public buildings is a high priority of the Greek Government, based on the above allocation. The selected buildings should have been constructed before 1980, i.e. before the Heat Insulation Regulation was put into force (insulations, frame and pane replacements etc.).

The Municipalities eligible for application in the program “EXOIKONOMO” should provide an integrated energy efficiency strategic plan as well as their detailed action plans.

In particular, each municipality should collect scientific and technical data (during preliminary energy audit), fill in the appropriate forms, develop appropriate energy studies for buildings and public spaces, and finally submit the following four (4) folders:

- FOLDER 1: Integrated Action Plan regarding the Program “EXOIKONOMO” for the period 2009-2015+.which includes:
 - Analysis of the objectives and the strategy of Municipal Authority regarding energy efficiency for the period 2009-2015
 - A summary of the projected energy efficiency interventions to be implemented within the period 2009-2015 accompanied by a time schedule
 - Current situation analysis. Analytical data regarding the energy consuming venues (buildings, lighting, vehicles etc) of the Municipality
 - Analytical list of energy efficiency Investments to be implemented within the period 2009-2015 with reference to these investments that will be financed by the initiative and the expected savings (in energy consumption terms)
 - Action plan for sensitization and alteration of energy consumption related behaviors
 - Justification of Municipal's Authority core competences and

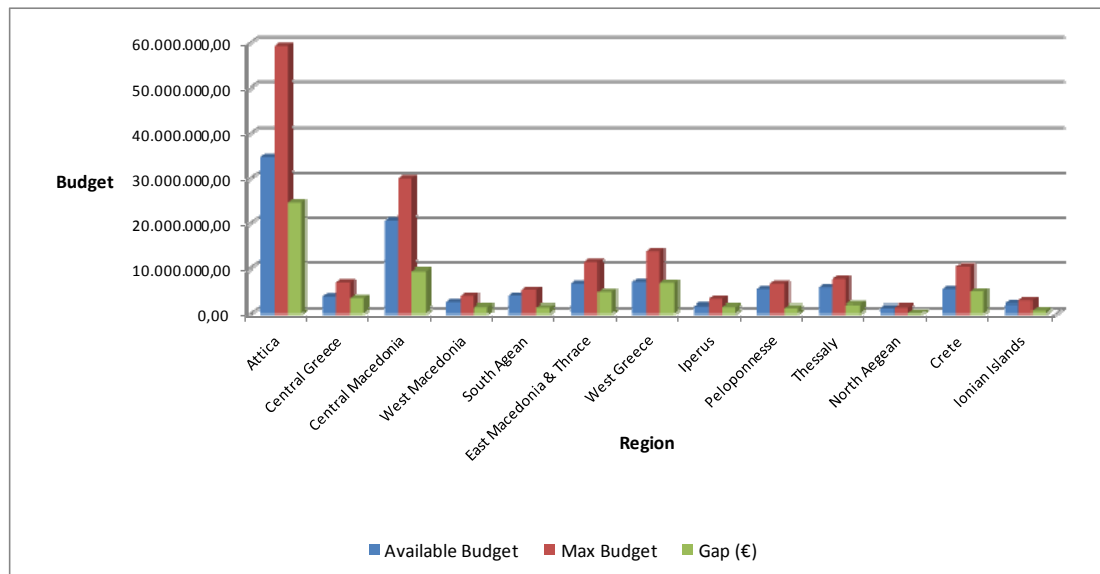
- capabilities to implement such measures
 - List of supplementary form of financing for implementing energy efficiency plan for the period 2009-2015
- FOLDER 2: Implementation Action Plan 2009-2011 and Application Forms, following the guidelines of the Monitoring and Management System of the “2007-2013 National Strategic Reference Framework”, which includes:
 - Objectives’ analysis and justification of the interventions’ mix to be implemented in the context of the initiative
 - A summary of the proposed interventions, the budget and the expected benefits
 - Justification of the proposed action plan in relation to the objectives of OP “Competitiveness & Entrepreneurship”
 - Structure of financing (grant and private contribution)
 - Analytical presentation of the proposed interventions per intervention axis (current situation analysis, detailed presentation of interventions, energy savings, budget, time schedule etc)
- FOLDER 3: Supporting Documents (certificates, legal documents - duly signed by mayor).
- FOLDER 4: Other Scientific Documents that justify the Proposal (energy audit questionnaires, energy analysis, energy balances, energy studies, designs, technical brochures, measurements etc).

The Integrated Action Plan (2009-2015+) includes strategy, targets, measures and activities in all sectors of energy conservation, energy efficiency and RES. The “Action Plan 2009-2011” includes the specification of the strategic plan in particular interventions, projects and activities..

The “Integrated Action Plan” requires primarily a summary of the strategic plan regarding energy efficiency for the period 2009-2015+: The summary should include the objectives and strategy to be implemented for the time period 2009-2015+ (in a maximum of 2 pages). The summary should also describe the relevant actions/measures undertaken, assess the quantitative impact/benefit that they will have on the environment and sustainable development as well as to indicate the required budget for each intervention implemented. The selected energy saving interventions should be timely apportioned for the period under consideration.

The deadline for submission of proposals was the 22nd of July. The number of proposals submitted was 189, while the total number of eligible municipalities was 230. The estimated budget of proposals is approximately €161,9 mil. while the total available budget of the initiative is €100 mil.

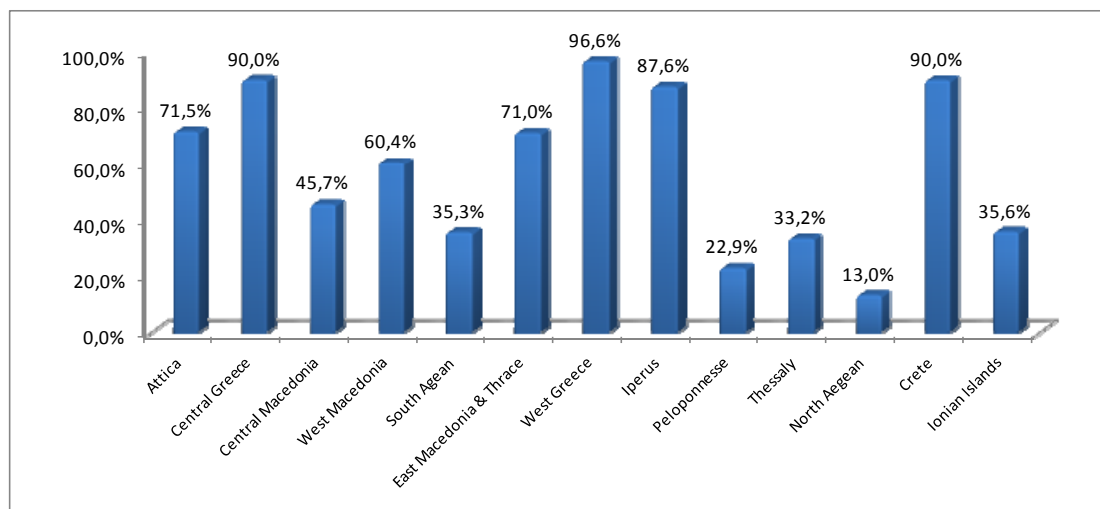
Figure 23: Estimated Budget Allocation compared to the Available Budget (on a Regional Basis)



Source: General Secretariat of Energy & Natural Resources – ex Ministry of Development

That means that, there is a financing gap of total value 61,9 mil (including public expenditure and municipalities' contribution) which is 61,9% deviation from the initial budget of the initiative. The following figure illustrates deviations from the budget by region:

Figure 24: Deviations from the Budget by Region



Source: General Secretariat of Energy & Natural Resources – ex Ministry of Development

According to discussions with the General Secretariat of Energy & Natural Resources, the initial intention was to distribute the available budget of the initiative

to the best proposals submitted, and not to allocate it to all Municipalities. Therefore, there is going to be a number of Municipalities that will not be able to take grants for the energy efficiency plan they submitted.

The organization responsible for receiving Municipalities' proposals is the Center of Renewable Energy Resources. However, it is not clear whether CRES will participate in the evaluation process, since the ministry proceeded to the establishment of an external evaluators' registry. Candidate evaluators for the registry should justify related experience to each intervention axis of the initiative as well as experience related to NSRF and CSFs. Additionally, it should be noted, that the set of criteria used are mostly related to the completeness of the application, necessity and eligibility of interventions and the energy savings to be achieved (in ktoe and Kwh terms). In most cases monetary benefits are not included in the evaluation, since they were not required in the action plan. Furthermore, it is not clear whether the feasibility of reported energy savings will be evaluated, or evaluators will accept the projected energy savings as reported. For the time being, the evaluation of proposals has not started yet.

2.1.2 The Initiative "Allazo Klima"

The initiative "Allazo Klima" (Replace Air-conditioning) addresses all citizens that possess obsolete air-conditioning equipment and wish to replace them. Every citizen may replace maximum 2 air-conditioners (as long as these air conditioners are technologically obsolete), with brand new equipment utilizing inverter technology and are highly energy efficient.

The total budget of the initiative, in public expenditure terms, was €15 mil and the grant quote was 35% with a maximum grant limit of €500 per household. Grant was computed on retail price of air-conditioners. The initiative was financed by the OP Competitiveness and the Regional Operational Programs and the authority responsible was the Intermediate Management Body for Energy, Natural Resources & Manufacturing.

The initiative operated through electric appliances retailers who were responsible to collect the appropriate documentation, collect obsolete equipment and transfer it to recycling centers. Citizens were just paying their share (65% of the retail price) for the equipment purchased and retailers were receiving the remainder amount according to the sales performed (provided that they also submitted the appropriate documentation).

The initiative started in early June 2009 and was scheduled to be completed in December 2009. However, due to excess demand, the initiative was completed on

22nd of August 2009. Public expenditure is expected to reach €40 mil, while the results of the initiative are summarized as following (source: Ministry of Development):

- Annual energy savings are expected to reach 41,6 Gwh, while the initial objective was for 16,96 Gwh
- Annual Reduction of CO₂ emissions is expected to reach 36,6 kt while the initial objective was for 14,9 kt
- Until the end of July 2009, 110.402 air-conditioners were replaced and recycled while the initial objective was for 45.000

According to discussions with the Intermediate Management Body of the Energy, Natural Resources & Manufacturing of the Ministry of Development, there is no intention to have a second round of financing for this kind of initiative.

2.1.3 The Initiative for Energy Conservation in Houses “EXOIKONOMISI KAT’ OIKON”⁷

The initiative for housing interventions related to energy efficiency was announced by the Ministry of Development in July 2009. The main objectives of the initiative are to reduce energy consumption of buildings (for housing purpose) and to reduce CO₂ emissions.

According to the preliminary planning performed by the Ministry of Development the core elements of the initiative were:

- Public Expenditure €400 mil. Estimated total expenditure (including private contribution) was expected to reach €1 bil. The contribution of ERDF to public expenditure was not estimated.
- Eligible buildings are those constructed before 1980⁸ (or the building permit was issued before 1980)
- Maximum eligible budget per building: €120.000
- The initiative addresses approximately 100.000 households
- Grant quote will range between 30% - 50%, according to:
 - The type of building (house or apartment blocks)
 - The location of the building
 - The kind of interventions implemented
- The eligible interventions are:

⁷ According to discussions with IMB for Energy, Natural Resources and Manufacturing, the political leadership of the new Ministry of Environment will probably reexamine the specifications of the initiative.

⁸ In 1980 the thermal insulation regulation was put into force

- Thermal insulation (on top of the building and on the building's shell)
- External aluminum frames
- Replacement of boilers (obligatory measure)
- Installation of solar water heaters

The management framework of the initiative includes the following agencies:

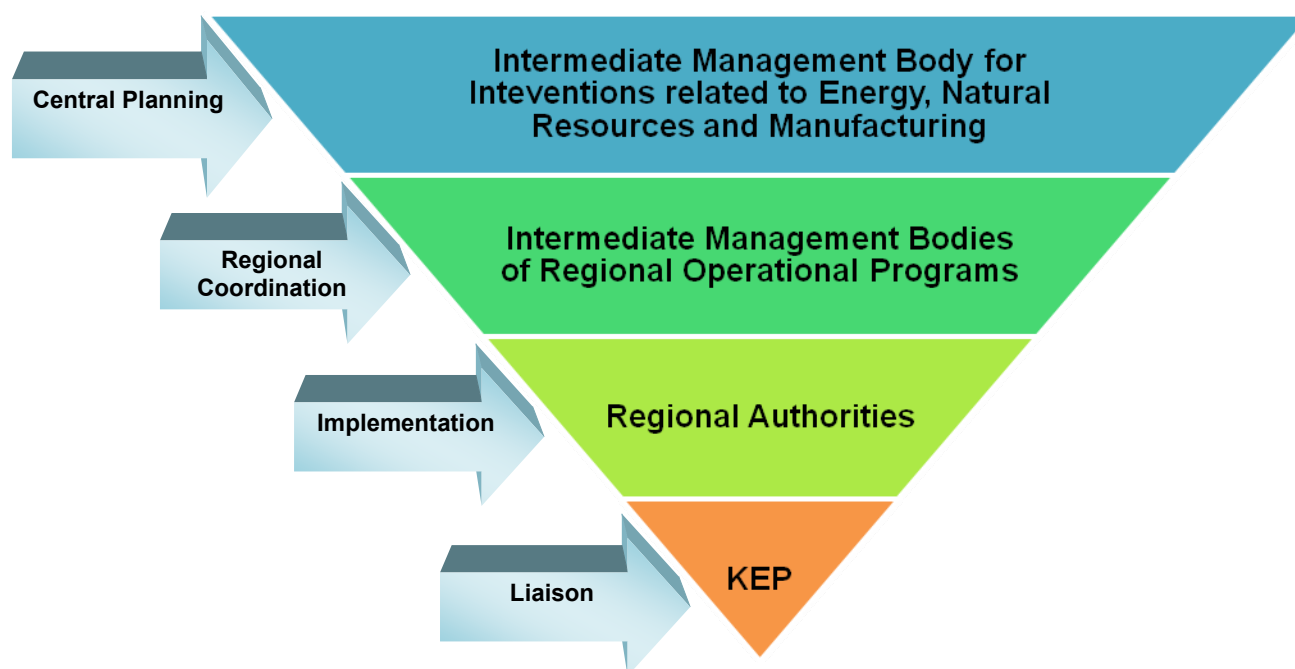
- Intermediate Management Body for Interventions related to Energy, Natural Resources and Manufacturing (ministry of development⁹). It is the competent body for planning the initiative and implementing supporting activities
- Intermediate Management Bodies of Regional Operational Programs. They are responsible for issuing calls for proposals and monitoring the process, until the approval of proposals at regional level, and coordination of the financing procedures
- Regional authorities. They will be responsible for evaluating proposals, auditing and paying the grants to beneficiaries
- Citizen Centers¹⁰ (KEP) which will be responsible for receiving applications, input application data to the information system and distribution of informational material to the public.

The following illustration presents the proposed management structure of the initiative:

⁹ After the amendments made by the new administration, the Intermediate Management Body for Interventions related to Energy, Natural Resources and Manufacturing is supervised by the Ministry of Environment, Energy & Climatic Change

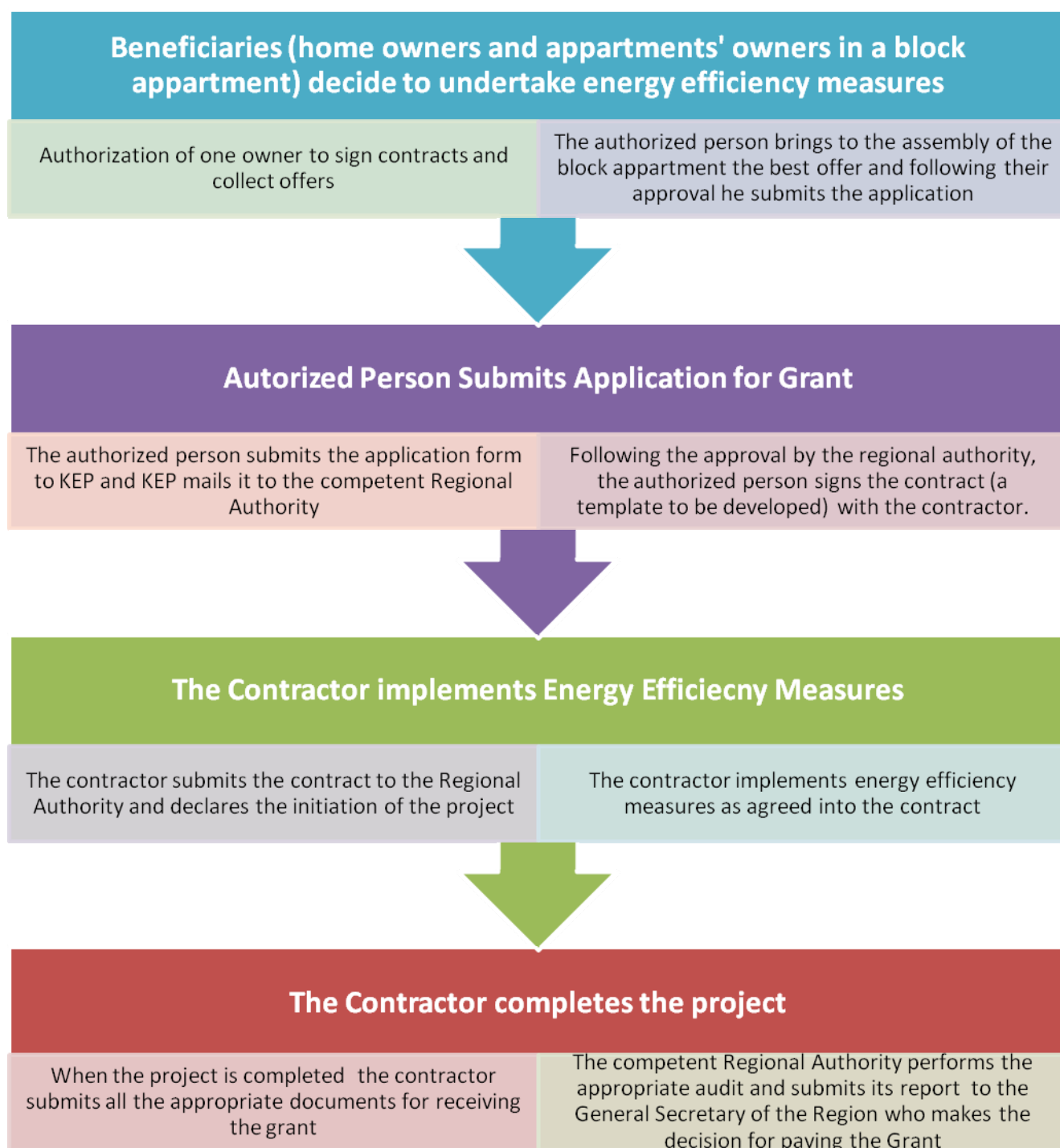
¹⁰ Citizen Centers is a relatively new structure established by the Ministry of Interior in order to reduce bureaucracy and provide better services to citizens.

Illustration 3: Proposed Management Structure of the Initiative



In the implementation phase, the core participants are the contractors who undertake the responsibility of implementing the energy efficiency measures in each building. The contractor will be responsible for the prompt implementation of energy efficiency measures and will be monitored by regional authorities. Following the audit of the projects, the authorities will pay the grant to the contractor and households will pay to the contractor the remainder amount. The preliminary process framework under which the initiative was estimated to run is presented into the following illustration:

Illustration 4: The Preliminary Process Framework of the Housing Initiative



The expected benefits, according to the preliminary announcements are:

- Reduction of energy consumption by 70% in 15.000 – 20.000 buildings. That means according to the Ministry's estimations approximately 1.500 Gwh annual energy savings
- Boosting the economy though the creation of additional demand in the constructions industry
- Financial benefits for Greek citizens through the reduction of energy

consumption.

The main obstacles to the implementation of this initiative are:

- There is no such a structure to ensure that energy efficiency measures proposed are necessary for each building. Greece lacks a legislative framework regarding energy audits and energy service companies
- As far as the block apartments are concerned, in Greece there is not such an institution such as the “Housing Associations” which would assume the authority to plan and implement energy efficiency measures in buildings. In Greece the only administration instrument is the General Assembly of each block of apartments which consists of the owners of the apartments. It is very difficult, especially in multi apartment buildings for the owners to reach an agreement regarding the necessity of such interventions and the cost burden.
- Delays in issuing the appropriate building permits required by national law for undertaking building interventions. The issuance of such a permit may last 6 months. Taking into consideration that the volume of applications will be radically increased if this initiative is implemented, then the possibility of enormous delays is very high.

According to discussions had with the relevant authorities the initiative is redesigned, however, the precise specifications have not been determined yet. It is estimated that the public expenditure for the initiative will be €50-€100 mil, while there is also the possibility to apply tax incentives to households that will implement energy efficiency measures in their houses.

It should be noted that, according to the report of National Council for Energy Strategy, total demand for housing energy efficiency interventions is estimated to €2,95 bil, while the number of households to be addressed is estimated to 250.000 until 2016. Total energy savings have been estimated to 3,4 TWh. The average cost per dwelling, according to the above data, is €11.800. The total amount estimated by the Council (€2,95 bil) exceeds by far the available ERDF allocation for energy efficiency interventions as provided by Regulation (EC) 397/2009 (4%). Therefore, since total ERDF's contribution to NSRF is €12,36 bil, the total available amount for housing interventions cannot exceed €494,4 mil ($€12,36 \text{ bil} \times 4\%$)¹¹. It is apparent that any kind of housing initiative will address only a fraction of total demand as estimated by the national council for energy strategy.

¹¹ In this amount, ERDF's contribution in the initiative “Allazo Klima” should be probably deducted (approximately €32 mil)

2.2 Operational Program Environment and Sustainable Development

Priority Axis 1, *“Environmental Protection & Urban Transport, Facing Climatic Change, Renewable Energy Sources”* has a specific focus on energy efficiency projects via a strategy that aims to reduce gas emissions, promote RES, and intervene in energy consuming economic activities. Priority axis 1 is financed by Cohesion Fund and its total available budget (public expenditure) is €403.99 mil, while Cohesion Fund’s contribution is €249,52 mil.

According to the review performed, and the discussions had with the Director and officers of the Managing Authority of the OP there are two calls for proposals currently running concerning the development of district heating venues.

- The first call for proposal regards the Municipal Enterprise for Water & Drainage of Florina (West Macedonia). It embraces one mega-project for the development of an integrated district heating system in the city of Florina including:
 - Development of pipeline network transferring thermal energy from the lignite factory of Public Power Company (PPC) to the city of Florina.
 - Development of distribution network within the city of Florina
 - Construction of pumping stations
 - Construction of boilers’ rooms
 - Supply of pumping equipment, boilers, distribution substations
 - Special refits in the factory of PPC required for the operation of the district heating venues.

The Municipal Enterprise of Water and Drainage of Florina has submitted a feasibility study as required by the regulations for mega projects and it was approved by the Managing Authority. Total budget of the project is €70,458 mil and it is 85% financed by the OP (Cohesion fund and national contribution). The project is expected to initiate in 2010 and to be completed in 2013.

- The second call for proposals addresses various beneficiaries like Municipalities, Prefectures, Municipal Water and Drainage Enterprises, Municipal District Heating Enterprises and other public agencies. The total budget (public expenditure) for this particular call for proposals is €50 mil, which means that it addresses smaller projects or / and complementary investments in existing district heating venues. According to discussions we had with the Managing Authority of the OP one proposal has been submitted by the Municipal District Heating Company of Ptolemaida. The project regards the connection of the existing district heating station with the thermal power

plant of PPC in Kardina (Kozani) and the expansion of the current distribution network. The total budget of the project is €32,8 mil and is 62,6% financed by the OP (cohesion fund and national contribution).

Priority Axis 6 “Environmental Protection and Facing Climatic Change” focuses mainly on indirect measures for dealing with atmospheric pollution and climatic change, namely supply of various atmospheric measurements instruments, implementation of studies, and policies for the maximization of buildings’ energy efficiency. This particular axis is financed by ERDF and its total budget (public expenditure) is €23 mil while ERDF’s contribution is €18,4 mil. This axis has not been activated yet.

2.3 Regional Operational Programs

Energy efficiency interventions for the objective 1 regions, as discussed in the inception report, are financed through the Operational Program “Competitiveness & Entrepreneurship”, while for Transitional Support Regions, financing is provided directly by the relevant Regional Operational Programs’ resources, by delegating management responsibility to the competent managing authority.

In what regards energy efficiency, planning is implemented at central administration level. Regional Managing Authorities delegate the authority of planning and implementing energy efficiency measures to the Intermediate Management Body for Natural Resources, Energy & Manufacturing.

The only energy efficiency related initiative currently running for transitional support regions is the initiative EXOIKONOMO as described in paragraph 2.1.1.

The forthcoming initiative related to housing (as described in paragraph 2.1.3), if implemented, will be co-financed by OP “Competitiveness & Entrepreneurship” for the objective 1 regions, and by Regional Operational Programs” for the Transitional Support Regions.

The following paragraphs describe briefly the content of the Regional Operational Programs related to urban regeneration and energy efficiency.

2.3.1 Regional Operational Program of Attica

Priority Axis 3 “*Reinforcement of Competitiveness, Innovation and Digital Convergence*”, provides, inter alia, for the development of sustainable energy sources and reinforcement of sustainability. In this context the strategy developed to

achieve this objective includes:

- Investments aiming to energy saving and improvement of energy efficiency in the manufacturing and service sectors
- Energy investments in public buildings and more generally in the public sector and households
- Biomass exploitation
- R&D for the promotion of innovative energy technologies

Total public expenditure of Priority Axis 3 is €709 mil, of which ERDF contribution is €528,94 mil. In the context of this particular priority axis the MA of the ROP of Attica delegated a total amount of €24,2 mil for the implementation of EXOIKONOMO in Attica.

In the programming document it is mentioned that financial engineering tools may be utilized for the implementation of innovative interventions in the context of this particular priority axis (indicatively the JEREMIE instrument is mentioned)

Priority Axis 4 “*Urban Areas Regeneration*”, provides for spatial and socioeconomic regeneration of urban areas giving the emphasis on the improvement of physical environment and the development of cultural, touristic and business activities. In this context, the strategy developed to achieve the objective includes:

- Urban regeneration interventions, such as brownfield development, buildings’ improvements, and communal space improvements
- Regeneration of Urban Areas through Pilot Innovative Interventions (Global Grants), such as spatial developments in urban areas, exploitation of Attica’s shores and emergence of metropolitan venues combined with the exploitation of Olympic venues.

The total public expenditure of Priority Axis 4 is €188 mil, of which ERDF contribution is €141 mil. In the context of this particular priority axis there are two calls for proposals which are currently running:

- The first one addresses Ministry of Environment, Ministry of Defense, Prefectures, Municipalities, and the Directorate of Public Works of Regional Authority of Attica. The eligible interventions include brownfield developments, development of recreation venues and shores’ regeneration. The total budget of this call for proposal is €50 mil of which €37,5 mil is ERDF contribution and €12,5 mil is national contribution. Since the proposals which were submitted did not fulfill the requirements of MA, it was decided to repeal this call and repeat it at a latter stage.
- The second call for proposals (titled as “Green” Life in the City) addresses

metropolitan municipalities of Athens and combines three thematic interventions:

- Projects aiming to increase / improve the functionality of communal spaces and to improve urban environment (establishment / improvement of play grounds, sports venues, planting in pedestrian ways, roofs of municipal buildings and squares, projects aiming to reduce urban noise)
- Projects aiming to improve accessibility and mobility (transportation studies, establishment / improvement of vehicle parking venues, creation of pedestrian ways, improvement of related infrastructures for the movement of disadvantaged people)
- Horizontal activities such as surveys and media type activities.

The total budget of this call for proposal is €100 mil of which €75 mil is ERDF contribution and €25 mil is national contribution. In the context of this call for proposals, approximately 60 Municipalities will be financed. The energy efficiency related activities in the context of this call of proposals regard mostly bioclimatic design interventions of small scale in communal spaces.

It should be noted that in the programming document of ROP Attica, it is clearly mentioned that it is possible to finance interventions related to the establishment of funds or holding funds. It is also mentioned that financial engineering tools may be utilized for the implementation of innovative interventions in the context of this particular priority axis (indicatively the JESSICA instrument is mentioned)

2.3.2 Regional Operational Program of Sterea Ellada, Thessaly and Epirus

Priority axis 2 “*Improvement of Infrastructures and accessibility services in Sterea Ellada*”, provides, inter alia, for the improvement of energy supply, further limitation of oil dependency (penetration of RES, improvement of energy efficiency and energy saving) and for Promotion of Innovation, R&D and environmental protection. In this context the strategy developed to achieve these objectives includes:

- Expansion of natural gas and electricity networks
- Safety in energy supply
- Modernization of energy infrastructure in health service venues
- Enlargement of islands’ energy capacity
- Investments aiming to energy saving and improvement of energy efficiency in the manufacturing and service sectors

Total public expenditure of Priority Axis 2 is €171,726 mil, of which ERDF

contribution is €61,61 mil.

In the context of this particular priority axis the MA of the ROP of Sterea Ellada, Thessaly and Epirus delegated a total amount of 3,6 mil for the implementation of EXOIKONOMO in Sterea Ellada.

Priority axis 4 “*Sustainable Development & Quality of Life in Thessaly*”, provides, inter alia, for environmental protection and sustainable development. In this context the strategy developed to achieve these objectives includes:

- Recovery & Sustainable development of communal space
- Thematic action plans

The total public expenditure of Priority Axis 4 is €327,9 mil, of which ERDF contribution is €229,53 mil.

Priority axis 5 “*Sustainable Development & Quality of Life in Sterea Ellada*”, provides, inter alia, for sustainable development of urban areas, as well as mountainous, insular, agricultural, coastal & touristic areas. In this context the strategy developed to achieve these objectives includes:

- Environmental management and utilization of business opportunities in the area of environmental protection
- Incorporation of environmental aspect in all developmental interventions
- Reduction of economic activity’s dependency on combustion fuels.

Total public expenditure of Priority Axis 5 is €310,362 mil, of which ERDF contribution is €138,141 mil.

Priority axis 6 “*Sustainable Development & Quality of Life in Epirus*”, provides, for the formulation of a new development model for environmental protection, economic sustainability and social justice. In this context, the strategy developed to achieve this objective is based, inter alia, on planning and implementation of urban regeneration plans, including accessibility, environmental, spatial planning and innovation interventions.

The total public expenditure of Priority Axis 6 is €248,843 mil, of which ERDF contribution is €161,62 mil.

It should be noted that in the programming document, it is clearly mentioned that it is possible to finance interventions related to the establishment of funds or holding

funds. It is also mentioned that JESSICA may be utilized as an alternative form of financing.

2.3.3 Regional Operational Program of Macedonia & Thrace

Priority axis 4 “*Digital Convergence & Entrepreneurship – Central Macedonia*”, provides, inter alia, for the empowerment of Central Macedonia’s role in the energy system of the country, as well as for the development of environmentally friendly forms of energy and the improvement of energy supply. Moreover, it aims to widening the utilization of natural gas and Renewable Energy Sources for improving energy efficiency.

The total public expenditure of Priority Axis 4 is €614,64 mil, of which ERDF contribution is €517,92 mil. In the context of this particular priority axis the MA of the ROP of Macedonia & Thrace delegated a total amount of 20,53 mil for the implementation of EXOIKONOMO in Central Macedonia.

Priority axis 5 “*Digital Convergence & Entrepreneurship – West Macedonia*” provides, inter alia, for utilization of energy sector deregulation, development of sustainable energy production methods & energy efficiency techniques, promotion of “green” entrepreneurship and reinforcement of the environmental aspect in the production process in West Macedonia. The energy related interventions included in this particular priority axis address mainly enterprises aiming to development of local SMEs and improvement of competitiveness.

The total public expenditure of Priority Axis 5 is €123,56 mil, of which ERDF contribution is €95.54 mil. In the context of this particular priority axis the MA of the ROP of Macedonia & Thrace delegated a total amount of 2,4 mil for the implementation of EXOIKONOMO in West Macedonia.

Priority axis 6 “*Digital Convergence & Entrepreneurship – East Macedonia & Thrace*” provides, inter alia, for spatial planning for the protection of geothermal Resources in East Macedonia and Thrace.

The total public expenditure of Priority Axis 6 is €37,205 mil, of which ERDF contribution is €16 mil.

Priority axis 7 “*Sustainable Development and Improvement of Life Quality in Central Macedonia*” provides, inter alia for environmental protection and sustainable urban development. Energy efficiency projects might be implemented in the context of interventions related to climatic change, natural resources management and

improvement of urban environment.

The total public expenditure of Priority Axis 7 is €1.711 mil, of which ERDF contribution is €895.039 mil.

In the context of this particular priority axis there is one call for proposals which is currently running. This call for proposals addresses municipalities over 10.000 inhabitants and combines two thematic interventions:

- Projects aiming to increase / improve the functionality of communal spaces and to improve urban environment (establishment / improvement of play grounds, sports venues, planting in pedestrian ways, roofs of municipal buildings and squares, projects aiming to reduce urban noise)
- Projects aiming to improve accessibility and mobility (transportation surveys, establishment / improvement of vehicle parking venues, development of pedestrian ways, improvement of related infrastructures for the mobility of disadvantaged people).

The total budget of this call for proposal is €73,14 mil (Public expenditure).

Priority axis 8 “*Sustainable Development and Improvement of Life Quality in West Macedonia*” provides, inter alia for environmental protection and sustainable urban development. Energy efficiency projects might be implemented in the context of interventions related to environmental protection (district heating networks bioclimatic planning) climatic change and to integrated urban development plans.

The total public expenditure of Priority Axis 8 is €324,978 mil, of which ERDF contribution is €243.98 mil.

Priority axis 9 “*Sustainable Development and Improvement of Life Quality in West Macedonia*” provides, inter alia for environmental protection and sustainable urban development. Energy efficiency projects might be implemented in the context of interventions related to environmental protection (district heating networks bioclimatic planning) climatic change and to integrated urban development plans.

The total public expenditure of Priority Axis 8 is €324,978 mil, of which ERDF contribution is €243,98 mil.

It should be noted that in the programming document of ROP Macedonia & Thrace it is clearly mentioned that it is possible to finance interventions related to the establishment of funds or holding funds. In addition it is also mentioned that for priority axes 7, 8 and 9 JESSICA may be utilized in order to mobilize resources quickly and efficiently.

2.3.4 ROP of Aegean Islands & Crete

Priority Axis 2 “*Improvement of Infrastructures and accessibility services in South Aegean Islands*” provides, inter alia, for sufficiency of energy supply and increase of energy production through Renewable Energy Sources. In this context, the strategy developed to achieve this objective includes:

- Expansion of electricity networks
- Utilization of geothermal resources
- Investment in RES
- Energy Management
- R&D for the promotion of innovative energy technologies.

The total public expenditure of Priority Axis 2 is €120,6 mil, of which ERDF contribution is €102,5 mil. In the context of this particular priority axis the MA of the ROP of Aegean Islands & Crete delegated a total amount of 3,8 mil for the implementation of EXOIKONOMO in South Aegean region.

Priority Axis 9 “*Sustainable Development & Quality of Life in South Aegean Islands*”, provides for rational utilization of natural resources and establishment of the appropriate environmental and social infrastructures. One of the strategic means for achieving this objective is the implementation of urban regeneration plans, emphasizing on urban areas that face particular financial, environment and social problems.

The total public expenditure of Priority axis 9 is €121,69 mil of which ERDF contribution is €46,7 mil.

The relative priority axes 7 & 8 (Sustainable Development & Quality of Life in Crete and North Aegean respectively) of the OP have approximately the same objectives and include also regeneration of urban areas as a strategic means to achieve their objectives.

Especially, in the context of priority axis 7 there is one call for proposals which is currently running. This call for proposals addresses 10 municipalities of Crete and concern interventions related to improvement of public space and restructuring of road networks. The total public expenditure is €8 mil.

It should be noted that in the programming document of ROP Crete and Aegean Islands, it is clearly mentioned that it is possible to finance interventions related to the establishment of funds or holding funds, while JESSICA is also mentioned as a

potential financial instrument for various axes of the program.

2.3.5 ROP of West Greece, Peloponnesus and Ionian Islands

Priority axes 7, 8 and 9 “Sustainable Development & Quality of Life” concern the Regions of West Greece, Peloponnesus and Ionian Islands respectively and provide, inter alia, for environmental protection and improvement of quality of life. In this context urban regeneration constitutes one of the main strategic means for achieving the objectives of these particular priority axes. The total public expenditure of Priority axes 7,8 & 9 is €863,8 mil of which ERDF contribution is €375,32 mil.

It should be noted that in the programming document it is clearly mentioned that it is possible to finance interventions related to the establishment of funds or holding funds, while JESSICA is also mentioned as a potential financial instrument for interventions related to axis 9 of the program.

3 Mapping of National Initiatives

3.1 The National Program for Local Development THISEAS

The National Program for Local Authorities “THISEAS” is a development program funded by the National Budget aiming to reduce disparities and improve competitiveness at local and national level. The total budget of the program exceeds €2 bil and consists of three subprograms namely:

1. **Organization and development of Municipal Authorities** (includes interventions related to the day-to-day operation of municipal authorities, such as the formulation of business plans, process reengineering, restructuring, technical support of PPPs, ICT systems)
2. **Local Development and Environmental protection** (includes interventions related to water and drainage infrastructures, waste management, flood prevention, land improvement, equipment acquisition, urban development etc)
3. **Social & Cultural Infrastructures / activities** (includes interventions in the areas of sports infrastructures, education / training, social welfare, health etc)

By reviewing the programming documents, the following findings related to energy efficiency came up :

- ⇒ Measure 2.6, “Dorps”, of the subprogram 2 which provides for interventions related to urban regeneration and environmental protection of urban and rural areas. Amongst these interventions, energy efficiency constitutes a component of the strategy of the measure.
- ⇒ Measure 2.8 “Support of Economic Activity” of the subprogram 2, which provides for interventions, inter alia, related to utilization of RES (energy saving).

According to data collected from Ministry of Interior, approximately 2.696 projects have been approved in the context of the above measures, whose total budget was €435,3 mil. All of these projects regard the implementation of regeneration of communal spaces, and some lighting interventions. There was no project regarding the implementation of energy efficiency measures and / or utilization of Renewable Energy Sources.

The program is at a closing stage, while the new program for local development (THISEAS 2) is expected to begin in 2010. According to discussions with the Directorate of Development Programs of Ministry of Interior, energy efficiency has not been included in the pre-planning phase of the Program as a particular priority. It is still implied in the context of other priorities of the program.

Another important issue to be stressed, is that, through the program, Municipal Authorities are supported to develop PPP projects in the following sectors:

- ⇒ Solid waste
- ⇒ Drainage
- ⇒ **Energy**
- ⇒ Culture – sports
- ⇒ Water supply

The PPP task force, established by the Ministry of Interior, has created guidelines to provide assistance to Municipalities in planning PPP projects in the above sectors.

Especially in the energy sector, four projects are planned¹², aiming to increase energy production capacity at local level by utilizing RES:

1. Development of a pumped storage system for the production of electricity

¹² These projects are in the stage of studying the feasibility and the requirements for proceeding in a tendering procedure

- and hydrogen in the island of Ios (Cyclades)
2. Development of a hydroelectric station in Municipality of Pieria
 3. Development of a pumped storage system for the production of electricity in Municipality of Eressos (Lesvos)
 4. Development of hydroelectric station in Municipality of Kyprinos (Evros)

The total budget of these projects and the estimated demand for financing as initially planned (according to the feasibility studies performed) are:

Project	Total Budget (€ mil)	Demand for Financing
Pumped storage system in Ios	30,5	10,67
Hydroelectric station in Pieria	1,02	0,707
Pumped storage system in Eressos	157	80,07
Hydroelectric station in Kyprinos	7,5	1,87
Total	196,02	93,317

3.2 Development Law 3299/04

Development Law 3299/04 is an initiative of the Ministry of Economy, Competitiveness & Shipping¹³ aiming to Balanced Growth, sustainable development, competitiveness' improvement, boosting of entrepreneurship, promotion of technological change and innovation, energy saving and regional convergence. Development law is co-financed by the National Investment Program and O.P. Competitiveness & Entrepreneurship.

Development law provides grants to enterprises from various economic sectors, such as manufacturing, tourism, telecoms, information technology, logistics etc. A special provision of the development law (article 3 paragraph e-iii) provides for investments aiming to energy savings to at least 10% of the consumed energy before the implementation of the investment. Moreover article 3, paragraph e-ii provide for investments aiming to the utilization of RES, substitution of liquid fuels or electricity with air gases, industrial waste and co-generation.

¹³ Ex Ministry of Economy & Finance

In addition, paragraphs (b v) and (b vi) of same article 3, provide for investments aiming to increase energy production capacity by utilizing RES such as wind, photovoltaics and biomass, while provision b iv provides for investments in district heating venues and co-generation.

The subsidy level for the above cases ranges from 15% to 60% according to the investment category, the geographic region and the size of the company (small – medium or large enterprise). At least 25% of the approved investment cost should be covered by the enterprise (as equity), while the remainder cost should be covered by an acknowledged banking institution in the form of a long term loan.

Although the budget of development law is a component of the national budget, this is not allocated based on investment categories, but on a first in first out basis, according to the applications for grants submitted.

The following table presents the applications submitted and approved in the above investment categories during the implementation of Development law 3299/04:

Table 4: Investment proposals regarding RES approved in the context of Development Law 3299/04 (in € mil)

	Number of Investment Proposals	Budget	Grants	Potential Demand
Wind parks	35	609,53	210,7	246,45
Hydroelectric	29	89,06	46,4	20,39
Photovoltaic	444	510,22	215,44	167,23
Other	16	64,26	28,07	20,13
Total	510	1273,07	500,61	454,2

It should be mentioned that especially in the case of Photovoltaic systems we expect that demand will be much bigger, because the latest production licenses were granted in July 2009. Since the acquisition of production license and installation license are basic requirements for submitting an application to Development Law 3299/2004, we expect a lot more applications into the future.

3.3 Photovoltaics on Roofs

“Photovoltaics on Roofs” is a national program which was initiated in 2009 and it will last until 2019. It addresses households and small businesses, for installing photovoltaic systems on the roofs of the buildings, of total capacity 10KWp maximum.

This program does not provide for any grants since the energy produced by PV systems is sold to the electricity distributor of the building by getting into an offset

agreement at specified prices¹⁴. The time interval of the agreement will be 25 years.

Revenue generated from selling electricity is not due to income tax and VAT. In addition, the installation of such systems needs a small scale building permit which is issued very quickly. The ministry of development (Center of Renewable Energy Sources) has issued an installation manual of PV systems and has initiated a shortlist of surveyors – contractors of such systems in order to facilitate beneficiaries of the program to install the appropriate system to their own building.

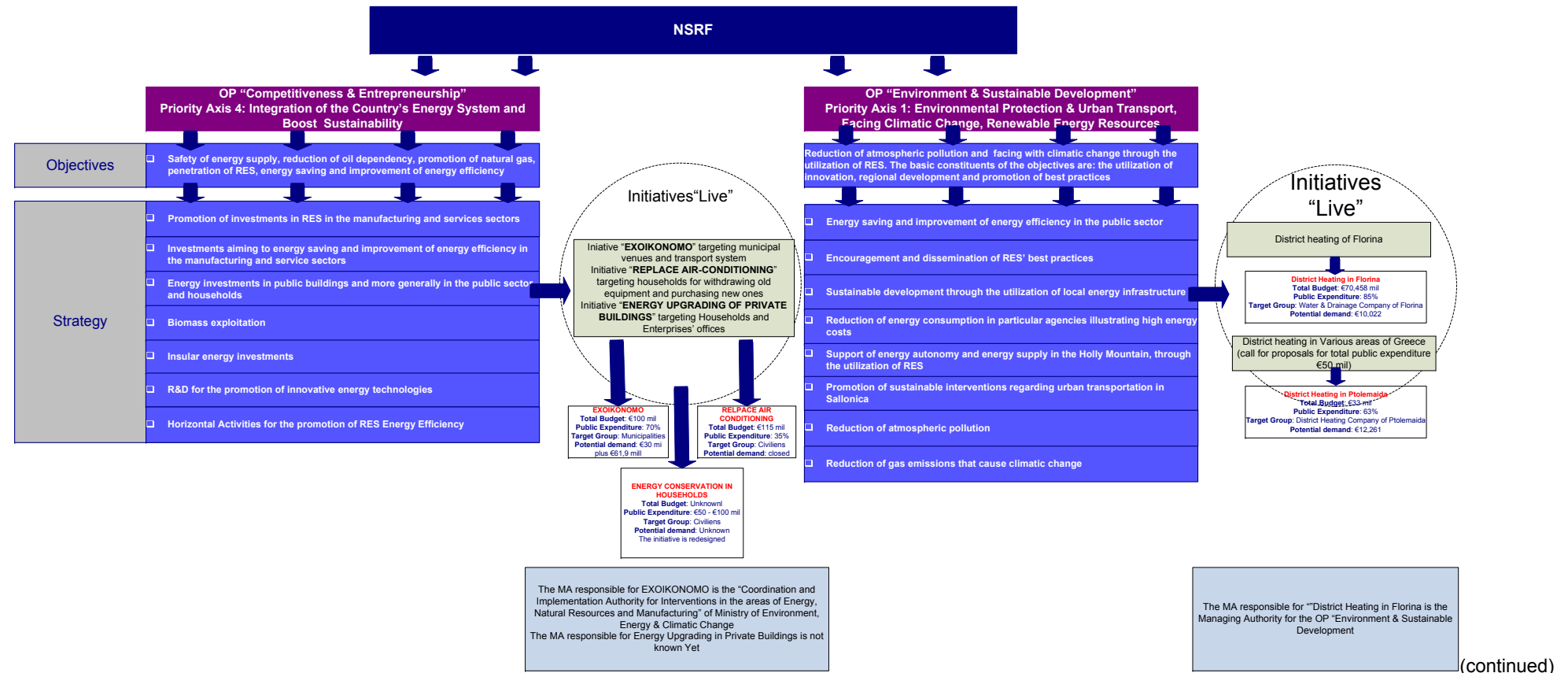
The provisions of this particular program do not allow for financing the installation of PV systems from national or European sources such as NSRF, development law or any other initiative.

4 Conclusion Drawn by the Mapping Process

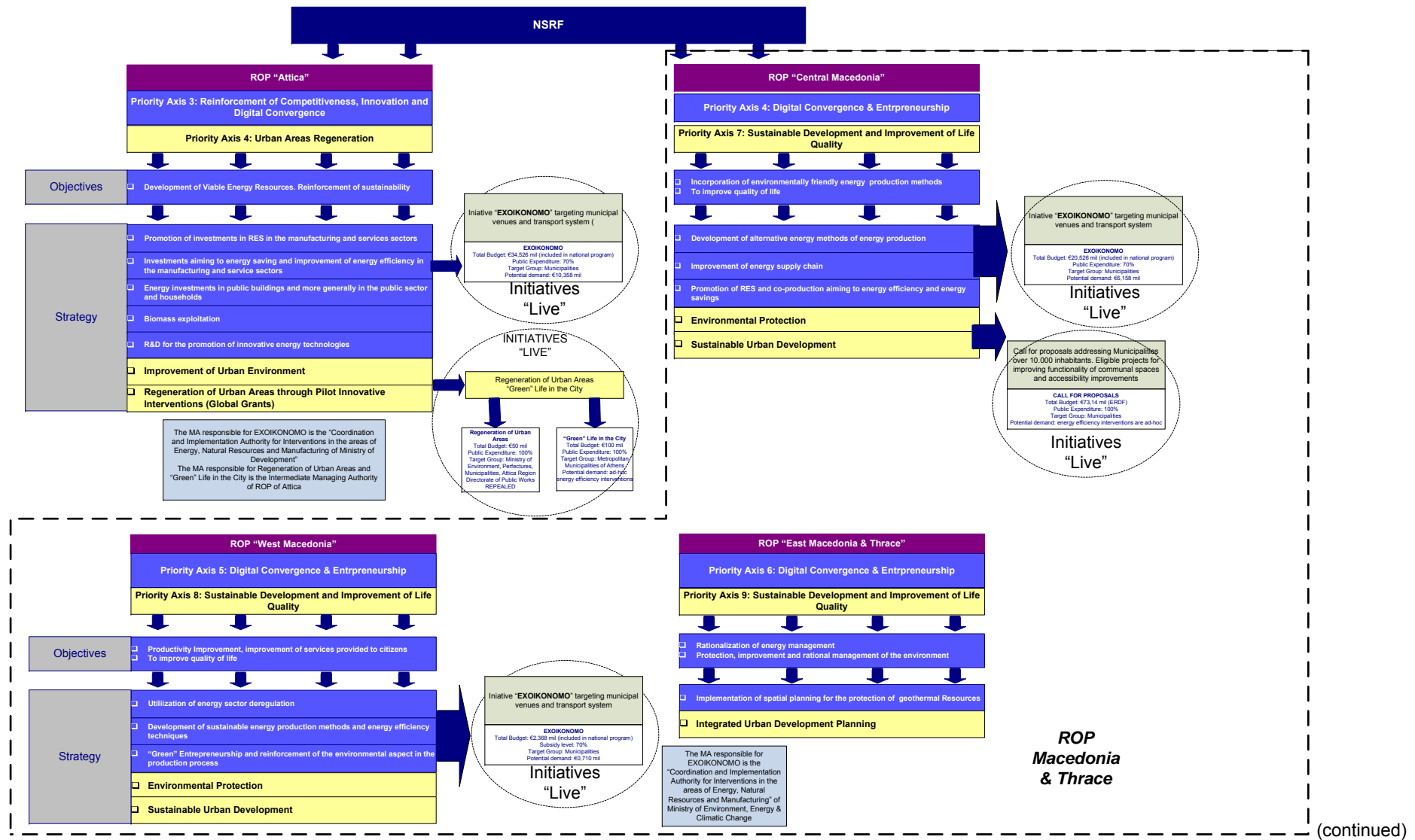
The following graphs summarize the preceding analysis of mapping energy efficiency initiatives in the context of NSRF and national programs.

¹⁴ The price of Kwh is €0,55 for every agreement concluded until 2011. After 2011 the price per Kwh is reduced by 5% annually.

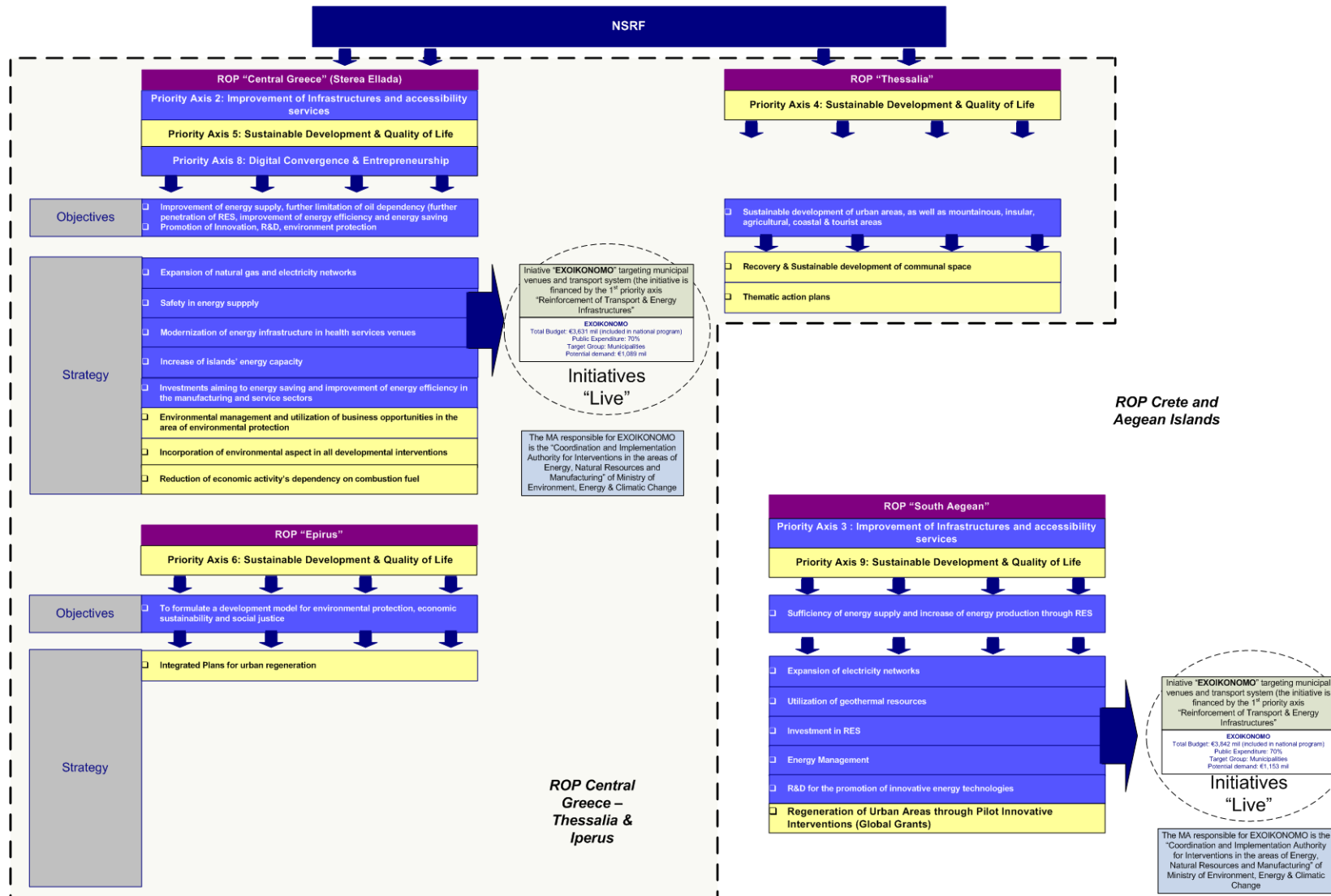
Graph 2: Mapping of Energy Efficiency Initiatives in the Context of NSRF



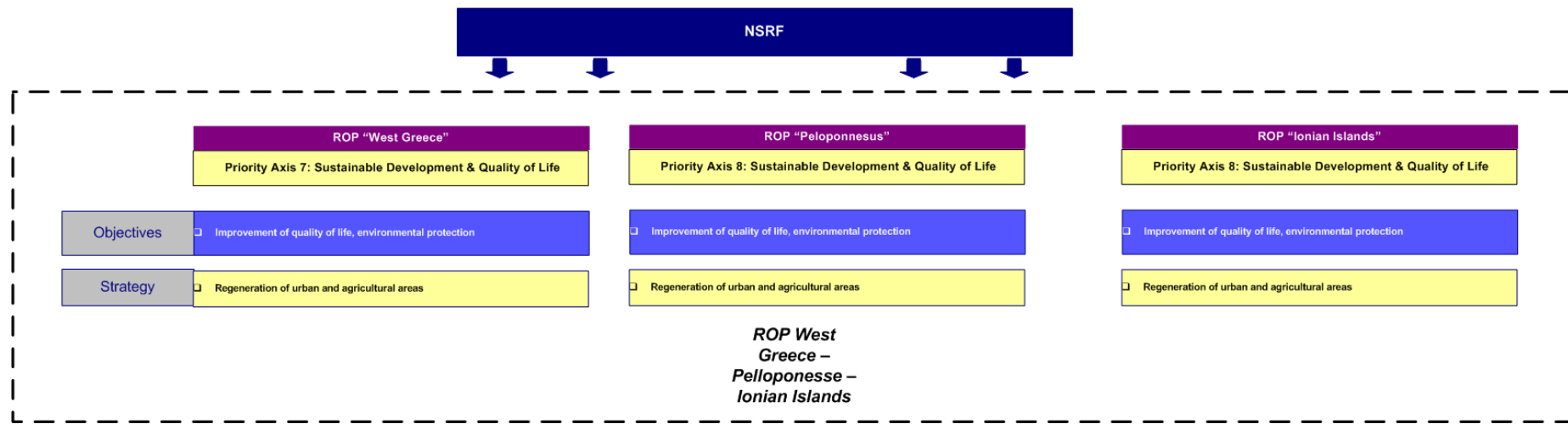
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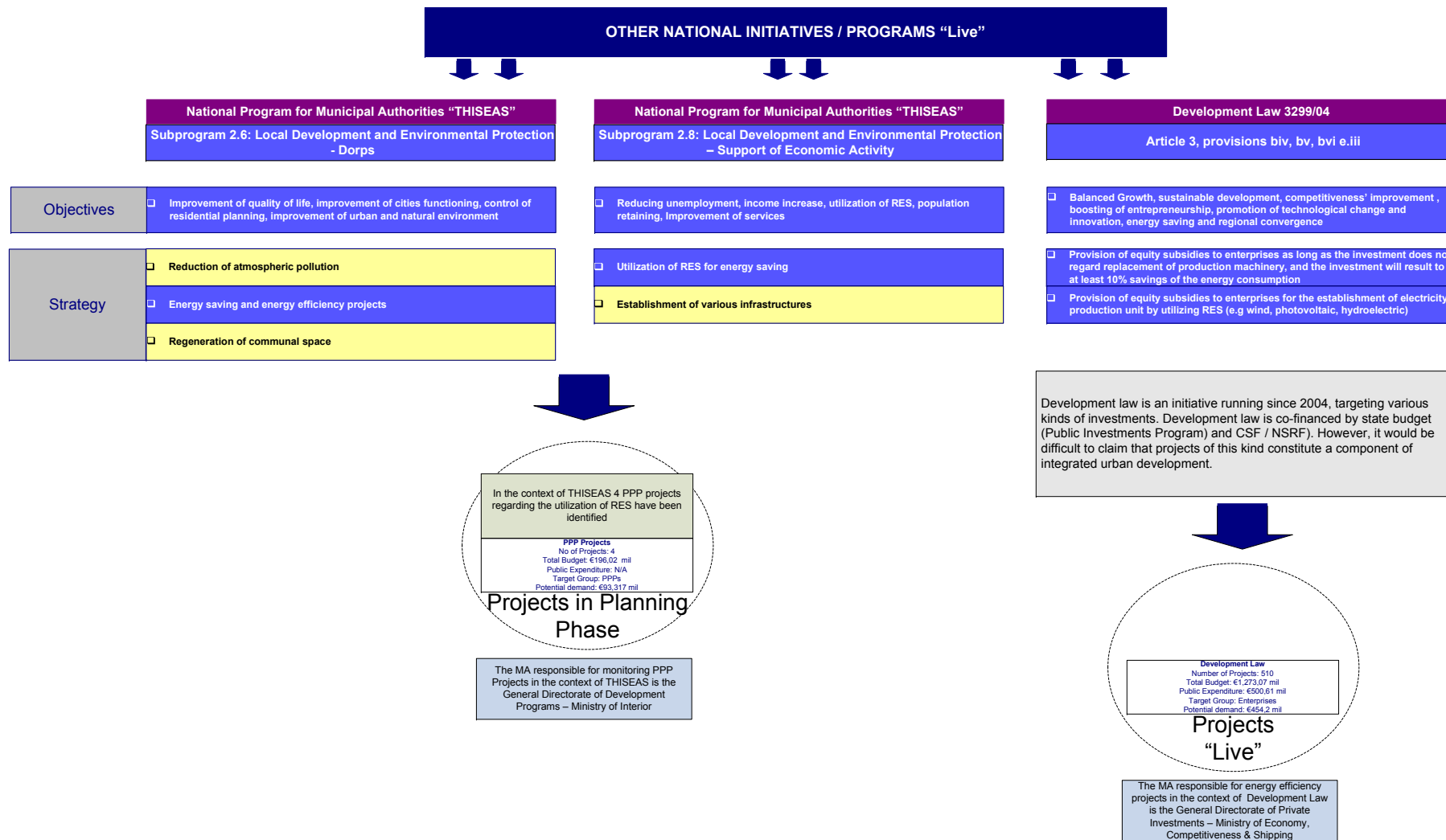
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(continued)



Graph 3: Energy Efficiency Initiatives in the Context of National Programs



The main conclusions drawn by the mapping process are:

- The most mature initiative is EXOIKONOMO, which is at the evaluation stage. Eligible interventions in the context of EXOIKONOMO fit well to integrated urban development since Municipalities will implement integrated action plans aiming to achieve significant energy savings and contribute to reduction of CO₂ emissions.
- The urban regeneration related interventions of Regional Operational Programs do not include specific energy efficiency interventions. They are mostly related to “typical” urban regeneration activities (such as brownfield development, promotion of cultural heritage, deprived neighborhoods improvements). Energy efficiency interventions, in this context have an ad hoc character, and are not based on integrated energy efficiency plans.
- There is a growing demand regarding district heating systems, especially in West Macedonia region, since we have two projects which are located in this region. This is due to the fact that in West Macedonia there are large venues of PPC which are fueled by lignite.
- There is a rapidly growing demand for the construction of Renewable Energy Production Facilities, especially in the context of Development Law. These investments, however, could not be eligible in the context of JESSICA, unless they would be a part of a more integrated local development plan, which combines complementary energy efficiency projects.
- A complementary to the above point is the gradual development of Private Public Partnerships between Municipal Authorities and private corporations. We identified 4 projects that are in the planning phase (the recruited advisors, have completed the preliminary studies) and regard the utilization of Renewable Energy Sources for development of electricity production facilities. These projects could be eligible for financing, in the context of JESSICA, if included in an integrated local development plan, or under a thematic UDF aiming to promote PPP projects regarding utilization of RES at regional or national level (see also case study 3).
- Housing is also a potential field of applying JESSICA as an alternative form of financing energy efficiency projects. For the time being current planning might include the provision of grants and tax incentives. JESSICA could be applied as a balancing instrument to finance part of private contribution (to the extent that there is no violation of state aid regulations) or as a stand – alone financing instrument into a further stage. A large opportunity for financing would exist in the context of the national program regarding the installation of

Photovoltaic systems on buildings' roofs. However, the relative legislative framework of this program forbids any kind of financial support, since households which will implement such measures will have a certain income from selling electricity to the network.

- As regards the overall planning environment regarding the utilization of JESSICA, according to the programming documents, it is mostly related to urban regeneration (thematic priority 61) in the context of Regional Operational Programs. Energy efficiency (thematic priority 43) does not constitute, until now, subject of financial engineering instruments. This, however, does not constitute a serious obstacle to the implementation of JESSICA, since the budget is allocated to priority axes, not to thematic priorities (allocation is indicative not obligatory as it is in the case of priority axes).

5 Legislation

5.1 NSRF

The Law 3614/2007 provides for the administration, monitoring and auditing of development interventions in the context of the programming period 2007-2013. Essentially, the law 3614/2007 describes an integrated administration system assigning roles and duties to various agencies and governmental institutions. The law 3614/2007 provides also for the establishment of new agencies that will assist the implementation of NSRF's interventions.

At this stage of the evaluation study there are three critical issues worth to be mentioned:

1. The first one regards the assignment of managerial and coordination roles to the various agencies of public administration. The main agencies are:
 - **Coordination Authority (CA) – Ministry of Economy Competitiveness & Shipping**, whose main tasks are to plan and coordinate the implementation of NSRF's Operational Programs and to direct managing authorities aiming to ensure the efficiency and legitimacy of OPs' administration and implementation (article 2)
 - **Managing Authorities (MAs)**, (article 3) whose main responsibility is to run Operational Programs according to the management and monitoring system (provided by the Law) as required by normal fiscal

practice. MAs involved in the context of the current evaluation study are (article 5):

- **The MA for OP “Competitiveness & Entrepreneurship”** which plays also the role of an Intermediate Management Body for Interventions related to Competitiveness & Entrepreneurship (under the authority of Ministry of Development) included in the Regional Operational Programs of transitional support regions.
 - **The MA for the OP “Environment and Sustainable Development”** which is also responsible for relevant projects funded by Cohesion Fund.
 - **The MAs for the Regional Operational Programs** of the five “Hyper” Regions, maintaining also the managing authorities of the programming period 2000-2006 (13 managing authorities) which are renamed to **“Intermediate Managing Authorities”**.
 - **Intermediate Management Bodies (IMB)**, (article 4) which are appointed by a ministerial decision, following recommendation of the competent MA. IMBs’ main responsibility is to administer part of the tasks should be performed by managing authorities, acting for the benefit of various beneficiaries who implement interventions under the authority and responsibility of MAs. IMBs may also undertake the role of managing and implementing interventions of global grants (following a ministerial decision), according to the article 42 of Regulation 1083/2006. The IMB responsible for the implementation of energy efficiency related interventions is the “Coordination & Implementation Authority for Interventions related to Energy, Natural Resources and Manufacturing”.
2. The second one regards the **incorporation of financial engineering tools** according to the regulations 1083/2006 and 1828/2006. More specifically, Article 24 – paragraph 1, provides for the establishment of funds, or funds of funds which will be financed through Operational Programs of NSRF. The establishment of the above financial engineering instruments is activated via a joint ministerial decision (Minister of Economy and Finance and the competent minister according to the funds’ objectives) which will also provide for the specifications, requirements and appropriate details for the organization and operation of the funds.

3. Article 24 (paragraph 3) of the L.3614/2007 provides for the modification of the constitutional law of “Consignment & Depository Trust (CDT)”¹⁵ by expanding its range of activities adding the objective “*Operation of Urban Development Funds as defined in article 44 of the Regulation (EC)1083/06 of the Council*”. Paragraph 3 of the article 24 provides also for the issuance of a presidential decree (following a recommendation of the Minister of Economy and Finance) which will define how the central and regional offices of CDT will be restructured in order to undertake the management of separate financing entities serving as Urban Development Funds according to article 44 of the Regulation (EC) 1083/06 of the Council and articles 43, 44 and 46 of the Implementing Regulation (EC) 1828/2006. The above presidential decree will determine funds’ responsibilities, their organization, the number and the kind of employees required, the operational framework and any other required detail.

The same article (paragraph 4) provides also that Prefectures and Municipalities and other local agencies may associate with Financial Institutions in order to establish Urban Development Funds according to article 44 of the Regulation (EC) 1083/06 of the Council and articles 43, 44 and 46 of the implementation Regulation (EC) 1828/2006. A decision of the Minister of Economy and Finance will specify the requirements and conditions under which Local Authorities will participate in Urban Development Funds (not issued yet).

5.2 Legislation related to Energy Efficiency

5.2.1 Law 3661/2008 Energy Efficiency of Buildings

Law 3661/2008 sets the framework for energy efficiency in almost all kinds of buildings. The main provisions of the law are:

- The issuance of a joint ministerial decision¹⁶ regarding the formation of “Regulation on Buildings’ Energy Efficiency” which will include:
 - The methodology for determining buildings’ energy efficiency
 - The minimum requirements regarding energy efficiency (they are re-examined in time intervals of 5 years)

¹⁵ Consignment & Depository Trust is a State Financing Organization providing loans to Local Authorities, Municipal Enterprises and public servants. It also provides cash management services to State Institutions, and reimburses beneficiaries in cases of expropriations

¹⁶ A draft of this joint ministerial decision has been put under public consultation t

- The specifications of energy efficiency surveys and the competent agencies for performing these surveys
- The content, frequency and the process for performing energy inspections in buildings, boilers, heating and air-conditioning systems
- The type and content of energy efficiency certificates and their issuance process (relative authorities, costs etc)
- Potential provision for incentives for improving energy efficiency of buildings
- The concepts of energy efficiency certification and energy efficiency inspector
- The issuance of presidential decree¹⁷ which will determine the appropriate qualifications and certification process of energy efficiency inspectors
- New buildings (following the issuance of the law and the joint ministerial decision) have to comply with the new legislation, while applications for building permits regarding new buildings or regarding renovation of existing buildings of total area that exceeds 1.000 m² should be accompanied by energy efficiency surveys
- The time intervals of inspection of boilers and air-conditioning systems according to the size of installed capacity
- The establishment of energy inspections' archive which include the energy efficiency certifications and the inspection reports of boilers and air-conditioning systems.

The law embraces private and public buildings. The following buildings' categories are excluded:

- Buildings used for religious purposes (churches etc)
- Monuments
- Temporary constructions
- Existing buildings that are used for less than 4 months per year (i.e cottage buildings)
- Houses of total area less than 50 m².

5.2.2 The Draft Law for Energy Efficiency Measures and Third Party Financing

The draft law for energy efficiency measures and third party financing aims to the incorporation of Directive 2006/32/EC into the National legislative framework. The main constituents of the law that should be mentioned in the context of the current study are the following:

¹⁷ A draft of this presidential decree has been put under public consultation

- Incorporation of Energy Service Companies (ESCOs) and energy service contracts. Energy service companies are entities that provide energy services and implement energy efficiency measures in buildings or other venues of their clients bearing technical and financial risk since compensation regarding energy services is based on energy savings achieved (as a percentage of annual cash savings achieved). ESCOs operate on the basis of **energy service contracts**. Energy service contracts will regulate the following:
 - Planning and implementation specifications of energy efficiency projects
 - The measurement methodology of energy savings achieved after the implementation of the project
 - Project financing and the payment method of ESCO
 - Purchase, installation and commissioning of the appropriate equipment
 - Operation of the purchased equipment
 - If the energy savings achieved are less than agreed, the ESCO is obliged to pay its client the deviated amount, under the condition that the client operates the equipment purchased according to the terms of the contract
 - In case that energy savings exceed the agreed amount then the additional savings go to the client unless otherwise agreed.
- Incorporation of Third Party Financing mechanism which is an agreement between a third party and the beneficiary of the energy efficiency measures. This third party finances the energy efficiency project and charges the beneficiary a percentage of the energy savings achieved. This third party might be ESCO itself or another entity.
- Until the submission of the second National Energy Efficiency Action Plan to European Commission, Greek administration may establish a national fund (Green Fund) for subsidizing programs and / or other energy efficiency initiatives as well as for developing the newly established energy services market. For the establishment of the Green Fund, the issuance of decree is required (following the proposition of Ministers on Economy and Environment) which will provide for all the technical and operational details of the fund. This decision will be promulgated to the European Commission according to the provisions of act 88 §3 of the Treaty.
- Moreover, the draft law provides for the introduction of financial engineering instruments and / or other financial incentives aiming to energy efficiency measures and the development of energy services market (a ministerial

decision is required). Accordingly, the draft law provides for the provision of de minimis grants aiming to the improvement of energy efficiency and development of energy services market.

It should be noted that the draft law was under public consultation and the previous administration intended to submit it to the parliament. However, the elections have interrupted the whole process. According to announcements made by the Ministry of Environment a new draft law will be placed to the internet for public consultation.

5.3 Financial Engineering Instruments

5.3.1 Venture Capital Mutual Funds

Venture capital mutual fund is the ancestor of venture capital corporations and was established as an institutional arrangement with the Law 2992/2002 (article 7). Venture capital mutual funds are closed end funds whose maximum duration cannot exceed 15 years.

Venture capital mutual funds invest in private companies (not listed in any stock exchange) with the forms of:

- Equity
- Convertible bonds
- Preferential bonds

Venture capital mutual funds do not constitute legal entities. They are represented by fund managers assigned by the funds' shareholders with a management agreement, between the fund, the trustee of the fund and the fund manager.

The minimum capital for VCMF is €3.000.000 and the minimum individual share in a VCMF cannot be less than €150.000. The fund cannot invest more than 20% of total capital committed in shares of one firm or many firms which constitute a conglomerate.

VCMFs are not subject to any tax (income, VAT or other tax). However, shareholders of VCMFs are taxed for gains realized through the liquidation of funds' investments.

5.3.2 The New Economy Fund (TANEO)

The new economy fund (TANEO) was established in 2000 with the law 2843/2000 (as modified by laws 2992/2002, 3091/2002 and 3606/2007). TANEO is a fund of

funds, which invests in venture capital funds (has the legal entity of Societe Anonyme). The only shareholder of TANEO is the Greek state and the company is under the authority of the Ministry of Economy, Competitiveness & Shipping. TANEO is mostly funded by long term bonds (€105 mil) the Greek state being the guarantor of the loan. Its share capital is €46 mil and it was co-financed by the Greek state and EU (ERDF) in the context of the operational program “Competitiveness” (3rd CSF).

A basic investment criterion for TANEO is that venture capital investments should be addressed to SMEs based in Greece which are not listed to any stock exchange. TANEO has invested until now approximately €147 mil to 11 venture capital funds of total capital committed €295 mil.

5.3.3 The Credit Guarantee Fund for small size enterprises (TEMPME)

TEMPME was established in 2002 with the Law 3066/2002 (as modified by laws 3190/2003, 3297/2004, 3434/ 2006, 3661/ 2008). TEMPME is co-financed by the Greek State and EU in the context of the Operational Program “Competitiveness” (3rd CSF). TEMPME is a financial institution which provides guarantees to small and very small enterprises (employing less than 50 people). TEMPE is a Societe Anonyme with total capital €240 mil. The total value of guarantees provided cannot exceed its equity multiplied by ten (€2,4 bil).

TEMPME has developed the following products:

- A basic guarantee product for small companies’ loans. The total number of companies that benefited from this product was 4.967 and total guarantees provided were €254,5 mil. The program expired in 31/12/2008
- A product mix of guarantees addressing investment needs of SMEs, subsidizing also the interest of the loans and / or leasing contracts. The total number of companies that benefited from this product was 2.245 and total guarantees provided were €189,9 mil. The program expired in 31/12/2008
- Guarantees and interest subsidies for working capital loans (still running).

6 Evaluation of JESSICA Potential in the Energy Efficiency Field

6.1 Energy Efficiency Financing Instruments – Good Practices

6.1.1 Energy Efficiency Funds in North America

The development of energy efficiency funds is very common in the United States of America. A common driver for launching energy efficiency funds was the Petroleum Violation Escrow Account (PVEA). The PVEA is derived from judgments against oil companies (and negotiated settlements with them) stemming from legal actions by the federal government for price over charges during the period from September 1973 to January 1981.

In the US, and Canada 34 state energy efficiency funds were identified (see following table). The vast majority of these funds are revolving and provide loans with flexible terms. In most cases the loan duration cannot exceed 10 years, while interest rates range from 3% to 7%. In some cases the funds may also provide equity and guarantees.

Financing may range from 25% to 100% of the project's cost, while in some cases there is a maximum amount to be borrowed regardless of the project's budget. Collaterals may be based on equipment purchased, personal guarantees of project owners, state guaranties, pledged energy savings and in many cases no collaterals are required. Project evaluation is mostly based on the energy savings to be achieved.

The main beneficiaries of these funds are:

- Municipalities
- Schools
- Hospitals
- Households
- Higher education institutions
- Other state agencies

In many cases beneficiaries of these funds are also businesses aiming to the implementation of energy efficiency measures and the utilization of RES, waste and incorporation of alternative fuels.

The following table illustrates the energy efficiency funds identified in the US market.

Table 5: Energy Efficiency Funds in the United States

	FUND NAME	ELIGIBLE PROJECTS	FUNDING MECHANISM	FUND ENDOWMENT	FUNDING INSTRUMENTS	INTEREST RATES	PAYBACK
1	US Small Business Administration Loan Programs For Energy Related Businessses	Renewable Energy Sources, Research and Development	Loan fund		Loans and loan guarantees		
2	Alabama Local Government Energy Loan Program	Energy efficiency measures in buildings of local governments and public schools	Loan fund	US \$ 2.000.000	Loans	Loan interest is 0% - at no time can the rate exceed 5%. ADECA-STE Division reserves the right to raise the interest rate on future loans.	7- 10 years
3	Alabama STAR (Savings Through Analysis and Retrofits) Program	Energy efficiency measures in buildings of local governments and public schools	Loan fund	US\$ 4.6 million – STE Division revolving fund provides 30% of funding and 70% comes from Region Leasing for each standard lease- purchase arrangement. For hardship cases, STE Division will provide 70% and Region Leasing 30%	Loans	Prevailing	Determined by the average simple pay-back period of project
4	Arizona- Municipal Energy Management Program	Various energy efficiency projects in Arizona cities, towns, counties, improvement districts and Indian tribes with populations under 70.000	Grants				
5	Arizona Energy Conservation Savings Reinvestment Plan: City of Phoenix	Renewable energy sources, small scale energy efficiency interventions in buildings and transport for Municipal Departments	Loan Fund	Oil Overcharge			
6	Arizona – The Revolving Energy Loans for Arizona Programs	Small scale energy efficiency interventions in businesses, public buildings and non-profit organizations	Loan Fund		Loans	7%	
7	California Department of General Service Management Department Revenue Bond Program	Energy efficiency measures in public venues Schools, colleges, municipalities, state agencies	Loan Fund	Varies- amount is dependent on the number pooled projects at the time of the bond sale. The sale takes place every 12- 18 months or when the al least US\$ 30 million in projects are ready for financing.	Loans	The interest rate is determined by the bond rate at the time of the sale. The bonds funding these loans are tax- exempt.	12-15 years

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	FUND NAME	ELIGIBLE PROJECTS	FUNDING MECHANISM	FUND ENDOWMENT	FUNDING INSTRUMENTS	INTEREST RATES	PAYBACK
8	California Energy Efficiency Financing Program	Energy efficiency measures in buildings and mechanical equipment of public sector	Loan program	US\$ 10 million from the State (as of April an additional US\$ 50 million)	Loans	The current rate is 3%	9 years simply payback and up to 11 years but the schedule will be determined by the projected annual energy savings from the project.
9	Canada- Green Municipal Investment Fund	Energy services, waste treatment for municipalities and their partners	Loan Fund		Loans and grants	No lower than Government of Canada bond rate	Up to 10 years
10	California State Assistance Fund for Enterprise, Business and Industrial Development Corporation	Energy efficiency measures and co-generation for businesses and non-profit agencies	Loan fund	US\$ 2.750.000	Loans	4 to 5%	5 years
11	Edmonton Alberta's Energy Management Revolving Fund	Energy efficiency measures in Cities' facilities	Loan fund	Currently \$5 million Canadian borrowing capacity	Municipality Association debenture funding	5- 7%	1.5- 4.8 with an average combined simple payback of 2.9 years. Loan repayment is calculated during the application process. The interest charge is equal to the city's short- term interest rate for the previous year. A fixed repayment schedule is calculated over five years, with the option of early repayment.
12	Hannon Armstrong Multi- Asset Trust('Hannie Mae')	Energy efficiency measures in buildings for public and private sectors	Energy Conservation Fund	US\$ Unlimited	Sale- purchase of receivables and ECP assets	Average Life Treasury Note plus a spread	Up to 25 years
13	Ibaho Energy Conservation Loan Program	Energy conservation measures and utilization of RES	Loan fund	US\$ 5.015.000- Oil overcharge: Ibaho received \$ 8.700.000 from the Exxon settlement and US\$ 3.800.000 from the Stripper Well settlement. The original amounts in the loan program were US\$ 3.090.000 in Exxon funds and US\$ 1.925.000 in Stripper Well funds.	Loans	4%	5 years
14	Indiana Industrial Energy Efficiency	Process improvement,	Loan fund	State Energy Program funds	Loans	0%	2-10 years

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	FUND NAME	ELIGIBLE PROJECTS	FUNDING MECHANISM	FUND ENDOWMENT	FUNDING INSTRUMENTS	INTEREST RATES	PAYBACK
	Fund	cogeneration and installation of latest manufacturing process technology for manufacturers					
15	Maryland Community Energy Loan Program	Energy efficiency measures in nonprofits, hospitals and private schools, local governments, public schools and community colleges	Loan fund	US\$ 3.2 million- Oil Overcharge Fund	Loans/ each applicant must make a contribution to the project	Average interest rate is 3.5% but is negotiated for each loan	7 years simply payback
16	Maryland State Agency Loan Program(SALP)	Energy efficiency measures in state agencies	Loan fund	Energy Overcharge Restitution Fund(EORF)	Loans	State Agencies pay 0%	10 years, but prefer less
17	Mississippi Energy Investment Loan Program	Energy efficiency measures in buildings (housing, partnerships and corporations)	Lon fund	US\$ 6 million	Loans	3% below the Prime Interest rate prevailing at the time of closing	10 years
18	Missouri Energy Loan Program(ELP)	Energy efficiency measures in schools and local governments	Loan fund	Energy Overcharge Restitution Fund(EORF)	Loans	Loan rates are at a fixed interest rate below market value	8 years or less. Payback is the cost of the energy project divided by the annual savings in dollars
19	Montana State Buildings Energy Conservation Program	Energy efficiency measures in state agencies' buildings	Loan fund	The state sells general obligation bonds, uses the bonds proceeds to pay energy efficiency improvements, then uses the resulting energy cost savings to pay debt service on bonds.	Bonds	Bonds presently have a 4.5% interest rate	10 years- typically DEQ needs 8 years payback to realize energy savings to pay dept service on bonds.
20	Nebraska Dollar Energy Savings Loans	Energy efficiency measures in residential, industrial and commercial buildings Utilization of alternate fuels and waste minimization	Loan fund	Oil overcharge/ US\$ 23 million	Loans	5% or less	10 years for home, building and system improvements, and 5 years for appliance replacements and the simple payback period for those projects requiring an audit.
21	New Hampshire Building Conservation Initiative(BECI)	Energy efficiency measures in state agencies' buildings	Loan fund	US\$ 25 million- a line of credit to be utilized over a period of 3 years is available to State agencies to implement energy and resource efficient building improvements.	Loans	3.85%	10 years
22	New York Energy Smart Loan Fund	Energy efficiency measures in any kind of building	Loan fund	A network of participating lenders including banks, credit		The lender's interest rate is bought down by 4.5%	Maximum 10 years

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	FUND NAME	ELIGIBLE PROJECTS	FUNDING MECHANISM	FUND ENDOWMENT	FUNDING INSTRUMENTS	INTEREST RATES	PAYBACK
		(residential, industrial, commercial etc)		unions, community development financial institutions, and farm credit associations.		percent. Interest rate reductions are available for the lesser of five years or the life of the loan	
23	Oklahoma Community Energy Education Municipal Program	Energy efficiency measures in buildings and communal facilities municipalities	Loan fund	US\$ 1 million- mixed sources, oil overcharge, state	Loans	2.5- 3.5%- interest rate is higher if an energy audit is included in the loan	Based upon projected energy savings
24	Oklahoma K- 12 School Energy Loan/Lease Program	Energy efficiency measures in public schools	Loan fund	Oil overcharge- US\$ 1 million	Loans	2.5-3.5%- interest rate is higher if an energy audit is included in the loan	18 months to 7 years
25	Oregon Energy Loan Program/ Small Energy Loan Program	Utilization of RES, energy efficiency measures in public buildings and communal spaces, alternative fuels, addressing all individuals, schools, local authorities, state and federal agencies, public corporations, cooperative, tribes and nonprofits	Loan fund	The Energy Loan Program is self- supporting and uses no tax dollars. Oregon general obligation bonds provide the funds for the loan	Loans	Loan rates are set after each bond sale and are fixed for the full term of each loan. The bonds sell at low rates because they are backed by the state of Oregon and, in many cases, the bond interest exempt	5 to 15 years
26	Pennsylvania GPU Energy: Sustainable Energy Fund	Renewable energy, energy efficiency measures and conservation to all kind of target groups	Loan fund	US\$ 12 Million from deregulation lawsuit	Loans/grants	Depends on type of projects/equipment- 2 to 5% to date	Depends on project 7- 10 years to date
27	Pennsylvania Sustainable Development Fund(PECO)	Renewable energy, energy efficiency measures and conservation for businesses and nonprofits	Loan fund	Capitalized at US\$ 32 million	Loans, equity, near equity investments	Flexible	Flexible
28	Pennsylvania West Penn Power Sustainable Energy Fund	RES, energy efficiency and energy conservation for various applications: residential, commercial, industrial, agricultural and institutional	Loan fund		Commercial loans, subordinated loans, grants, royalty financing, and equity investments	All terms and conditions are determined on a case-by- case basis	
29	South Carolina Conserfund Load Program	Energy efficiency measures, fuel conservation, water conservation, to state and local governments, schools and colleges, hospitals and nonprofits	Loan fund	Stripper Well Settlements funds authorized under State Energy Program	Lender may offer loan or lease purchase agreement	1% to Lender, maximum of 5% to Borrower	Maximum of ten years, but may not exceed life of equipment
30	South Carolina Enerfund Loan Program	Energy efficiency measures in buildings and venues of	Loan fund	Stripper Well Settlement funds authorized under State Energy	Lender may offer or lease	3% to Lender , maximum of 7% to Borrower	Maximum of fifteen years, but may not

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	FUND NAME	ELIGIBLE PROJECTS	FUNDING MECHANISM	FUND ENDOWMENT	FUNDING INSTRUMENTS	INTEREST RATES	PAYBACK
		enterprises, utilization of waste as biofuel, alternative transportation fuel equipment and RES		Program	purchase agreement		exceed life of equipment
31	Tennessee Local Government Loan Program(LGLP)	Energy efficiency measures in public buildings	Loan fund	Petroleum Violation Escrow(PVE Funds)	Loans	Currently 3%	7 years
32	Tennessee Small Business Energy Program (SBELP)	Energy efficiency measures in buildings of small businesses	Loan fund	Petroleum Violation Escrow-Stripper	Monthly payment amortized loans	3%	Up to a maximum of 7 years depending on simple payback of project
33	Texas LoanSTAR (Savings Taxes and Resources) Revolving Loan Program	Energy efficiency measures in buildings of state agencies, institutions of higher learning, schools and local governments	Loan fund	The Oil overcharge in 1976/US\$ 98 million	Loans	Loans interest Rates are currently set at 4.25% APR for school Districts	8 Years and is being to 10 years
34	Toronto Atmospheric- Fund	Retrofits, utilization of new technologies and "soft" measures (community action, feasibility studies) for community groups, government organizations and public institutions.	Loan fund	An endowment of CA\$ 23 million from the sale of city property	Loans and grants		

6.1.2 The Bulgarian Energy Efficiency Fund

The Bulgarian Energy Efficiency Fund (BEEF) is a legal entity, established in accord with Chapter 4, Section I of the Energy Efficiency Act (EEA) from 2004. BEEF manages the financial resources received by the Republic of Bulgaria from the Global Environment Facility (GEF) through the International Bank for Reconstruction and Development (IBRD) and from other donors. BEEF is an **independent legal entity**, separate from any governmental agency or institution, and performs its activity in accordance with the EEA, the current legislation framework and the agreements with the major donors.

BEEF is structured as a self-sustainable commercial entity that concentrates its efforts on facilitating energy efficiency (EE) investments and on promoting the development of an effective EE market in Bulgaria. The Fund's main environmental objective is to support the identification, development and financing of viable EE projects, resulting in substantial reduction of greenhouse gases (GHGs)

BEEF is mainly financed by the Global Environment Facility of World Bank, the Government of Austria and the Government of Bulgaria. There is a limited number also of private investors that contributed BGN 200.000. The total capital of BEES is approximately €11 mil.

BEEF provides three main product categories:

- **Loans** to municipalities, corporations and private individuals. Annual interest rate ranges from 6% to 9% for municipalities and from 7% to 10% for corporations and private individuals. The maximum duration of the loan must be 5 years and the minimum contribution of the project owner ranges from 10% to 25%.
- **Partial Credit Guarantees.** Two types of guarantees are offered:
 - Partial - 80% on a "pari passu" basis
 - Partial - 50% on a first-loss basis after the bank-creditor

Partial credit guarantees are provided for an annual fee of 0,5%-2% for a time frame of 5 years

- **Portfolio Guarantees.** Two types of portfolio guarantees are offered:
 - *ESCO portfolio guarantee (minimum 5% of defaulting portfolio)* - to attract more ESCO companies into this business and to make ESCOs more comfortable by guaranteeing the risk of their counterparties - the project beneficiaries. Normally ESCOs would bid for a project and then go to a bank to secure finance for it, or have a line of financing ready and fill it in with projects. The shortcoming of this approach is

that typical ESCOs rely heavily on raising debt to fund their performance contracts. This requires that the cash flow of their business is very accurately timed and budgeted. Delayed payments from clients, or defaulting clients may severely disrupt the servicing of the debts of the ESCO itself. With BEEF's ESCO portfolio guarantee, BEEF undertakes some of the risk of the ESCO and guarantee that they will cover such disruptions in the flow of receivables of the ESCO

- *Residential portfolio guarantee* - to kick-start the market of EE investments in the residential sector, by providing market products that overcome the lack of legislation in the country. The guarantee works in the following way: BEEF helps the households in a building to develop a good project. Then a first class company is selected to implement the investment. The bank gives the funds to the project developer, but the repayments afterwards come from the individual households. Each household pays proportionately to their built-up area. BEEF guarantees that it will cover the first 5% of defaults within this block (or portfolio of blocks).

Portfolio guarantees per project do not exceed BGN 800.000 (approximately €400.000).

The organization of BEEF consists of three management instruments:

- The Donors' Assembly, which consists of the four primary sources of financing. Donors' assembly convenes at regular session every two years
- The Management Board is the primary governance body responsible for the overall strategic management of BEEF in compliance with its stated objectives and principles of operations. The management Board consists of seven members. As defined in the Energy Efficiency Act (EEA) and in accordance with national legislation, these members are appointed, as follows:
 - A representative of the Ministry of Economy and Energy, designated by the Minister of Economy and Energy, acting as the Management Board Chairman;
 - A representative of the Ministry of Environment and Waters, designated by the competent Minister;
 - The Executive Director of the Energy Efficiency Agency;
 - Four representatives of the private sector. These four non-government representatives are elected and appointed by the Donors' Assembly.

The Management Board sessions are convened every month, upon formal invitation by the Management Board Chairman

- The Fund Manager, which is the Consortium "Econoler-EnEffect-Elana"(EEE). The consortium is composed of the Canadian energy efficiency consultancy "Econoler International", the Foundation "Center for Energy Efficiency EnEffect" and the non-banking financial institution "Elana Holding" PLC. The Fund Manager is responsible for the entire day-to-day operation of BEEF and for implementation of the project cycle. Its main objective is to operate the Fund as a profit-oriented business in such a way that promotes EE investments and helps a sustainable energy efficiency market to develop in Bulgaria. The fund manager selects and applies the appropriate financing tools based on specific project circumstances and overall project portfolio management considerations

6.1.3 The Central Energy Efficiency Fund - Scotland

In 2004, the Scottish Government announced the launch of a new Public Sector Energy Efficiency Initiative. Under this initiative, £20 million in new funding was provided over 2004/05 and 2005/06 to implement energy efficiency and, from 2008, renewable energy measures, to reduce carbon emissions across the public sector in Scotland. The scheme applies to all Scottish local authorities and health boards as well as Scottish Water.

The funding has been used to set up revolving funds, with zero interest, administered at local level. The savings from energy efficiency measures are then used to invest in further energy efficiency measures and to improve frontline services

Within CEEF, £15 million is allocated to the 32 local authorities in Scotland, £4 million to the NHS trusts and £1 million to Scottish Water. The scheme has since been extended to provide £4 million to Higher Education.

Each local authority has been allocated a proportion of this £15 million based upon a combination of the population in their city/region and their geographical area. The individual local authorities are responsible for managing their own CEEF allocation and identifying potential capital projects. Funding can only be spent on capital projects, but up to 10% of the fund can be used each year to cover running costs.

To be eligible for CEEF funding, projects must use specific energy saving technologies and must meet a five-year payback criteria. Renewable Energy technologies can also be considered so long as the criteria are met. Technologies eligible for CEEF funding are:

- Building Controls
- Cavity Wall Insulation
- Change of Fuel
- CHP
- Cooling Controls
- Draught Proofing
- Improving Boiler Plant
- Low Energy Lighting
- Motors and Drives
- Other
- Pipe Insulation
- Point of Use Hot Water
- Pool Covers
- Roof Insulation.

Once a potential project has been identified, the local authority must complete an on-line application form that requires information on the capital cost of the project, energy use before project implementation, an estimate of energy use after implementation and the price paid for the energy. The form will then automatically calculate the potential annual energy, financial and Carbon Dioxide savings alongside the project's payback period. This is based upon default parameters for the eligible technologies. If the payback does not meet the criteria, the project will be deemed ineligible. However, if the project meets the criteria, the local authority submits the project application that then commits them to spend the money and implement the project. It is expected that once a project has been submitted, the project will be implemented shortly thereafter. Submitted applications are stored in a central on-line system and can be accessed by all other local authorities.

Once spent, the local authorities are required to repay the cost of each project at quarterly intervals within the payback period calculated during the application process.

6.2 The Banking System & Energy efficiency financing in Greece

Energy efficiency is becoming gradually a serious case for banking institutions. The recent legislative initiatives regarding the utilization of Renewable Energy Sources (L.3468/2006), the energy efficiency in buildings (L.3661/2008) and the national program regarding the installation of Photovoltaic Systems on houses' roofs, became the basic drivers for some banking institutions to develop specialized products to finance relevant projects.

Following a market research to banking institutions' web sites we identified two main product categories:

- Loans provided to households for the implementation of energy efficiency measures in their houses. These products are basically driven by the national program for the installation of PV systems on roofs, which under certain conditions ensures a stable revenue stream, thereby facilitating the payments of debt service
- Loans provided to enterprises for the development of Photovoltaic stations of businesses having a capacity of no more than 150 KW. The basic drivers for launching these products are:
 - They are eligible for grants in the context of Development Law 3299/04. Most of the banks do not finance these investments if they have not been approved by the Ministry of Economy, Competitiveness & Shipping
 - The average amount for this size of investment does not exceed €500 thousand, and the proportion of the loan will not be more than 60% on the above amount, that is €300 thousand. These investments have a stable revenue stream, thereby reducing the risk undertaken
 - PV systems of capacity less than 150 Kw are excluded from the issuance of production permits. It is much easier to install such a PV station, when compared to bigger capacity PV stations.

The following table presents the existing financial products addressing energy efficiency projects in the Greek market.

Table 6: Financial Products regarding Energy Efficiency

Banking Institution	Name of product	Term of the Loan	Interest Rate	Eligible Investments	Beneficiaries	Amount
Alpha Bank	Photovoltaic loans	10	3 months Euribor + 3,75%+0,6%	PV systems of up to 150 Kw	Enterprises	15%-60% of initial investment, basic criterion to be granted by Development Law 3299/04
National Bank of Greece	Green Loan	up to 7	ECB + 6%	Energy efficiency measures in households, PV on roofs, purchase of hybrid vehicles	Households	up to €30.000
National Bank of Greece	Energy production through Photovoltaic systems	up to 10	5,75% - 6,85%	PV systems of up to 150 Kw	Enterprises	15%-60% of initial investment, basic criterion to be granted by Development Law 3299/04
Pireaus Bank	Green loans	up to 10	7,30%	Energy efficiency measures in households, PV on roofs	Households	up to €50.000
Pireaus Bank	Photovoltaic solutions	flexible	euribor / libor + spread	Photovoltaic systems	Enterprises	flexible
Commercial Bank	Home ecological	up to 10	3 months euribor +6,5%+0,6%	Energy efficiency measures in households, PV on roofs	Households	up to €30.000
EFG Eurobank	Ecological - Photovoltaics	flexible	varies	Photovoltaic systems	Households	up to 100% of PV cost
Agricultural Bank of Greece	Photovoltaic systems financing	up to 15	varies	Photovoltaic systems	Enterprises	15%-60% of initial investment, basic criterion to be granted by Development Law 3299/04

Finally, during our discussions with representatives of Commercial Banks¹⁸ the following comments were made that should draw our attention:

- In order to leverage private resources from banking institutions, structural funds should invest in UDFs a critical mass of resources. It was avoided to refer to a specific amount, however it seems that a threshold for banks is approximately €50 mil per UDF.
- The proposed management structure of UDFs through a legal entity or a separate block of finance within a financial institution was considered very costly by banks' representatives. Especially in the case of implementing a housing UDF.
- Collaterals in case of loans is a very critical issue for banks in order to invest in UDFs
- Banks are very cautious regarding as energy generation investments through RES because of the delays incurred in issuing the appropriate licenses.
- The minimum budget per project as far as PPPs are concerned should be no less than €30 mil in order to be considered by banking institutions.

6.3 Criteria Evaluation

In the inception report, four sets of criteria have been set upon which the evaluation of JESSICA will be implemented. These sets of criteria are:

- The fit of energy efficiency in the context of integrated urban development
- The existence of sufficient demand regarding energy efficiency projects
- The maturity of the initiatives planned
- The readiness of the country to incorporate JESSICA for energy efficiency into the whole organizational and administrative mechanism.

The following paragraphs summarize the evaluation of each criterion based upon the findings of the previous analysis.

6.3.1 Relationship between energy efficiency and Integrated Urban Development

In chapter 1 of the current study, the concepts of sustainable development and integrated urban development were investigated and the fit of energy efficiency with these concepts was justified. Although this analysis is more of theoretical character, it is proved that energy efficiency measures constitute an integral component of integrated urban development. On top of that, energy efficiency measures, when implemented in an integrated way may serve well the basic concepts of

¹⁸ In this meeting which was organized by the Hellenic Banks Association the following banks were represented: EFG Eurobank, Marfin Egnatia Bank, Attica Bank, HSBC, Bank of Cyprus, Emporiki Bank, Piraeus Bank, Millennium Bank, Agricultural Bank of Greece.

sustainability, thereby forming integrated urban development plans themselves (see the evaluation matrix in paragraph 1.2.2).

The case of “EXOIKONOMO” initiative in Greece is an indicative example of integrated action plans that contribute to the environmental, economic and social development of cities based on a strategy formulated by Municipal Authorities. The undertaking of combined measures such as retrofits, regeneration of communal spaces, alteration of transport systems, equipment improvements and publicity activities, constitute an integrated urban development plan, contributing to environmental, economic and social benefits.

In addition, although the preceded conceptual analysis is useful for justifying the feasibility of utilizing JESSICA in the context of energy efficiency, housing initiatives which are under development in Lithuania and Estonia illustrate more practically the tendentiousness of implementing energy efficiency measures through the JESSICA mechanism.

6.3.2 Existence of Sufficient Demand

The existence of sufficient demand consists of two subsets of criteria:

- The first subset of criteria is related to the demand for energy efficiency interventions emerged by the condition of current infrastructures and the evolution of energy consumption. The relevant indicators investigated were the following:
 - **The age of buildings.** A large proportion (77%) of the existing buildings were constructed before 1980. As mentioned in paragraph 1.3.3 the year 1980 constitutes a major threshold in terms of the age of the buildings since in 1980 the new thermo-insulation regulation was put into force. According to this information, it seems that there is an urgency for undertaking energy efficiency measures in buildings constructed before 1980.
 - **The per capita energy consumption.** Although Greece illustrates low per capita energy consumption when compared to EU average, in terms of evolution, Greece is placed above the European average since the relative energy consumption index in 2005 rises to 139,5, while the European average declines to 99,7. It is clear from the dataset (see also paragraph 1.3.1) that Greece illustrates a rising per capita consumption, an opposite trend when compared to EU 27.

- **The dependency of the country on conventional energy sources and the energy generated from renewable sources.** Datasets illustrate the Greece is heavily relied on conventional energy sources, while energy generated from RES constitutes only 5% of total consumption, despite the fact that Greece's climate favors the utilization of RES. Finally, the utilization of combined heat and power generation systems is very limited, when compared to EU average.
- The second subset of criteria is related to the actual number of energy efficiency projects planned, and how these projects are translated into monetary terms. The consultant identified approximately 700 projects of total value €1,653 bil, of which 510 projects (total value €1,19 bil) regard the utilization of RES in the context of Development Law. Total demand for financing is estimated to €629,5 mil, of which €472,4 mil are addressing enterprises' needs for implementing RES investments.

Sufficient demand could also be expected in the context of housing interventions. However, the demand in monetary terms cannot be estimated, since the initiative is redesigned. In general terms, approximately 2,12 mil buildings built before 1980 might be potential beneficiaries in the context of an energy efficiency program. By applying socio-economic criteria the above number might be significantly reduced, however it will definitely exceed 20.000 houses (this was the initial objective of the housing initiative which is redesigned). If we multiply 20.000 houses by an estimated average renovation cost of €20.000 per house then total demand may reach €400 mil.

The preceding analysis leads to a summary of the existing energy efficiency projects running in the context of European and National Programs.

Table 7: Summary of Energy Efficiency Projects

Program	Beneficiaries	Project type	Status	Number of Projects	Budget (€mil)	Supply of Financing (€mil)	Potential Demand for Financing (€mil)
Competitiveness & Entrepreneurship and Regional Operational Programs of Transitional Support Regions	Municipal Authorities	Energy efficiency measures in municipal venues	Running	189	€161,9	70	91,9
	Households	Energy efficiency measures in houses	forthcoming	unknown	€2.950 (est)	€50 - €100	unknown
Environment & Sustainable Development	Water & Drainage Companies Municipal Authorities	District Heating	Calls for proposals are running	2	103,26	80,98	22,280
Development Law 3299/04	Private Enterprises	Renewable Energy Sources	Running	510	1.273,07	500,61	454,19
Public Private Partnerships	Municipal Authorities and Private Enterprises	Renewable Energy Sources	Planning	4	196,02	102,85 ¹⁹	93,17

¹⁹ This number is estimated based on the potential of financing these projects by Development Law 3299/04.

6.3.3 *Maturity of the initiatives*

The third set of criteria is related to the maturity of the initiatives planned. According to the definition of this criterion we distinguish initiatives in two basic categories:

- Those initiatives that are in the phase of execution, including initiatives that are currently running and / or initiatives that will be “live” in a short time frame.

In this category, we identified the following:

- The initiative EXOIKONOMO. Municipal authorities have developed their integrated plans and submitted them for evaluation since 22nd of July 2009
- Individual enterprises' projects for utilization of RES which are funded by Development Law 3299/04.
- District heating projects. Two calls for proposals are currently running and two projects have been approved by the MA
- Initiatives that are in the planning phase, while execution is expected to run in a time frame more than a year. In this category we identify
 - PPP projects developed by municipalities, aiming to utilization of Renewable Energy Sources.
 - The housing initiative which is re-planned from the beginning.

Moreover, it should be noted that during the planning phase of the above projects the incorporation of JESSICA, as a potential financing instrument has not been taken into consideration. However, in the programming documents of NSRF, financial engineering instruments are considered to be an alternative financing mechanism, especially in the case of Regional Operational Programs regarding the priority axes of urban regeneration. In this particular case, however, energy efficiency does not constitute a priority theme. Energy efficiency could be implied in the context of integrated urban regeneration through ad hoc interventions included in a more generic development plan.

6.3.4 *Legislative Capability*

The previous analysis regarding the legislative framework of Greece in the energy efficiency sector leads us to the following conclusions:

- For the time being, Greece lacks an integrated legislative framework that incorporates the EU directive 2006/32 regarding energy assessments and the institutionalization of Energy Service Companies (ESCOs) and third party financing schemes. This is a major obstacle for developing an “energy

efficiency market” which would boost project development according to specific & measurable objectives.

- The legislative framework of NSRF (L.3614/2007) has provided for the incorporation of financial engineering instruments, like JESSICA, in NSRF. However, the technical and operational details of UDFs will be determined by ministerial decisions and presidential decrees which have not been issued yet.
- Greece has incorporated in the past financial engineering instruments, such as TANEQ, TEMPME as well as the Venture Capital Mutual Funds. Although the above structures may not fit very well to the philosophy and the operations of JESSICA, according to the consultant’s view this should not constitute a serious obstacle to the establishment of appropriate structures, since it is more a matter of central planning and political will to utilize JESSICA and less a matter of existence of appropriate legislative instruments.

6.3.5 Concluding Remarks of Criteria Evaluation

In making an overall assessment of the potential of implementing JESSICA in energy efficiency in Greece, we conclude that energy efficiency constitutes an appealing field of action since there is sufficient demand in terms of projects to be implemented into the future. The basic issue to be dealt with is that most of the existing projects are not incorporated into an integrated development plan which would justify the utilization of JESSICA. The basic driver of the market until now is indeed the utilization of Renewable Energy Sources and this does not justify integrated urban development, unless it would be incorporated in a local or regional development program stimulated by local authorities’ initiatives (utilizing also PPPs).

It is very urgent to put forward the incorporation of directive 32/2006, regarding Energy Service Contracts and third party financing, since the lack of such a framework does not allow the development of an energy efficiency market. This would be the major instrument for paving the way for utilizing in an appropriate way financial instruments such as JESSICA.

The cases of EXOIKONOMO and the forthcoming initiative related to housing are the most appealing - in the short to medium term- initiatives to be financed by JESSICA. The remainder initiatives, although they constitute a significant proportion of potential demand, should be approached on a more integrated way which is, according to our view, a matter of central and regional planning.

6.4 Case Studies

The following case studies illustrate examples of energy efficiency and RES projects that are in their planning phase. The role of the consultant in these cases is to present the basic characteristics of these projects and the expected benefits and to simulate their financial results so that to investigate the potential of financing in the context of JESSICA instrument. Three case studies were selected:

- The energy efficiency plan of Rhodes' Municipality
- The Green Energy Plan in Corfu Community: Energy Efficiency Measures in Commerce and Service Shops
- An Integrated RES system based on pump storage for producing electricity and hydrogen

6.4.1 CASE STUDY 1: the energy efficiency plan of Rhodes' Municipality

6.4.1.1. Introduction

The initiative "SAVE or EXOIKONOMO (ΕΞΟΙΚΟΝΟΜΩ)" is implemented in the context of the "2007-2013 National Strategic Reference Framework".

The initiative includes development and implementation of integrated action plans for improving energy efficiency in municipalities. In particular, the aim of the program is related to the improvement of energy performance of buildings, energy saving in public lighting, the bioclimatic design of communal spaces and energy conservation in structured environment. In addition, the program focuses on undertaking energy efficiency measures in local transport as well as energy conservation measures in electromechanical urban venues such as pump stations.

The scope of the current Case Study is to investigate the potential of implementing JESSICA as a complementary financing instrument in the context of the integrated action plan for improving energy efficiency of Rhodes' Municipality.

6.4.1.2. The City of Rhodes

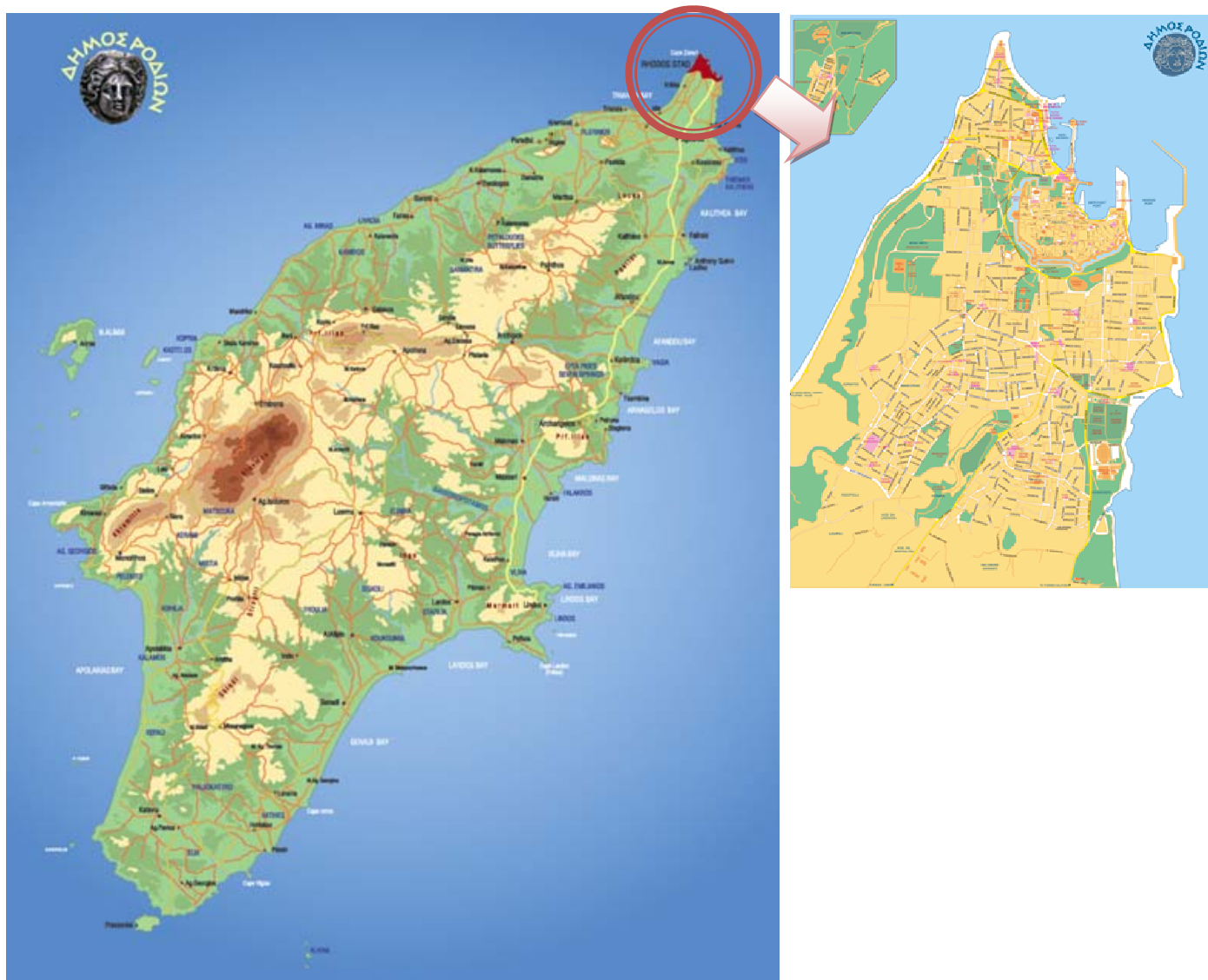
The island of Rhodes is situated at the crossroads of two major sea routes of the Mediterranean, one being the Aegean Sea and the other being the coasts of the Middle East, Cyprus and Egypt.

Rhodes is the largest island in the Dodecanese Prefecture. Its capital city, located at its northern tip, is the capital of the Prefecture with the Medieval Town in its centre. In

1988 the Medieval Town was designated as UNESCO World Heritage City. The Medieval Town of Rhodes is the product of different architectures belonging to various historic eras, predominantly those of the Knights of St. John.

Rhodes is the capital city of the island and the capital of the Dodecanese prefecture. It has a population of approximately 55 thousand inhabitants. Rhodes has been famous since antiquity as the site of Colossus of Rhodes, one of the Seven Wonders of the World. The City of Rhodes is a popular international tourist destination.

Illustration 5: Rhodes' Map



6.4.1.3. The Urban Sustainable Strategy for the Period 2009-2015+ by the Rhodes Municipality: Emphasis on Energy Efficiency

Rhodes Municipality developed a strategic plan for improving energy efficiency in the context of National and European Union (EU) energy policy. Within this context, the Municipal Council of Rhodes has submitted an application for financing from “Exoikonomo” Initiative of the Ministry of Development, aiming to further support the

implementation of its energy efficiency strategy. In particular, the energy efficiency strategic plan has the following objectives:

- Improvement of living conditions as well as housing quality in the buildings and the communal space of Rhodes Municipality.
- Reduction of the final energy consumption by fossil fuels and the reduction of carbon emissions.
- Support of the local economy of Rhodes Municipality aiming at the creation of new jobs related to environmentally friendly energy technologies.
- Increasing awareness of citizens in Rhodes Municipality regarding energy efficiency and environmentally friendly energy technologies issues.
- Enhancement of the long term integrated energy regional planning of Rhodes' Municipality.
- Contribution to the effective application of energy efficiency technologies and practices, by the end energy users – citizens of the Rhodes Municipality.

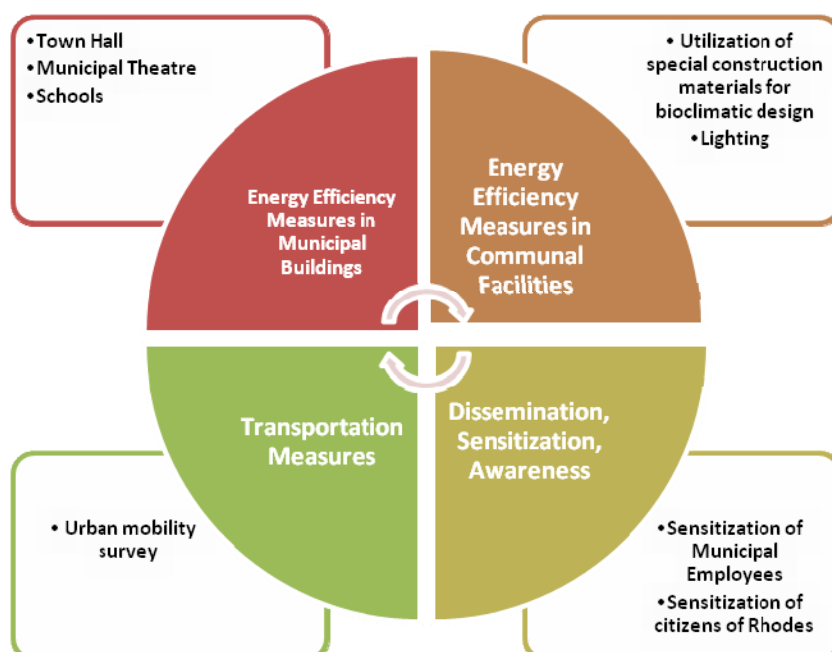
6.4.1.4. Energy Efficiency Action Plan for the Period 2009-2011

The integrated energy efficiency action plan of Rhodes' Municipality consists of four basic categories of interventions, as provided by the initiative "EXOIKONOMO":

1. Energy Efficiency Measures in Municipal Buildings
2. Energy efficiency Measures in Communal Facilities
3. Transportation Measures and
4. Dissemination, Sensitization, improvement of awareness

The following graph illustrates the planned interventions, and the following paragraphs describe analytically the measures to be undertaken, making references on the results of energy assessments, the activities to be implemented, the budget and the estimated amount of savings.

Graph 4: The Interventions of Rhodes' Municipality in the context of its energy efficiency action plan



6.4.1.5. Energy Efficiency Measures in Municipal Buildings

Results of Energy Assessments

There are four buildings which will be renovated in the context of the energy efficiency action plan undertaken by Rhodes' Municipality:

- The **town hall**, which is a classical building and has been built during the Italian occupation period (1938-1939). Due to its traditional characteristics, every kind of intervention is under the authority of the Municipal Department of Medieval City Protection. Due to its historical character every kind of intervention should be undertaken very cautiously so that no to disturb its traditional heritage. The replacement of old windows, doors and shutter assemblies is quite urgent, but the new equipment has to be in accordance with the historical character of the specific building. It is noted that a small number of windows have been recently replaced aiming to energy efficiency and improvement of the standards of living of the building's users. As far as lighting is concerned, old-



tubular fluorescent lamps are used in the building. The central heating system has been out of operation during the last five years. The local air conditioning units are used for covering both, the thermal and cooling needs. The use of the local units is wasteful and environmentally unfriendly

- The municipal theatre is also a classical building which was built in 1938-1939. It is located in Eleftheria's Square, near the city hall of Rhodes Municipality. It is also under the authority of Department of Medieval City Protection and due to its historical character every kind of intervention should be undertaken very cautiously. The building suffers from inefficient frames and insulation, but the new equipment has to be in accordance with the historical character of the building. The heating system has been out of operation during the last five years. The local air conditioning units are used for the covering both, the thermal and cooling needs.



- The 15th primary school of Rhodes was built in 1984 and is located at Konstantinoupoleos Street. The building suffers from inefficient frames and shutter assemblies, while there is an urgent need for improving the existing lighting system. One of the reasons this school was chosen for implementing energy efficiency measures was that the local school community is very sensitive to such issues. It has to be noted that a number of awareness and sensitization activities have been implemented by the local community of the school.



- The complex of 1st high school of Rhodes was built in 1975 and consists of 6 separate buildings utilized for classes, offices and laboratories. The buildings suffer from significant thermal energy losses due to inefficient frames.



The Proposed Energy Efficiency Interventions

In the context of energy efficiency improvement of Municipal Buildings, the following eligible interventions are planned:

- Thermal Insulation
- Replacement of frames, doors and shutter assemblies
- Improvement of the Lighting System
- Installation of Energy Monitoring and Assessment systems

The allocation of interventions in each building is presented into the following table:

Table 8: Buildings' Interventions

Building	Interventions	Investment Cost (€)	Annual energy saving benefits (KWh)	Annual financial gains (€) ²⁰
Town Hall	<ul style="list-style-type: none"> • Insulation • Replacement of old windows, doors and shutter assemblies • Improvement of the Lighting System • Energy monitoring and assessment systems 	360.343,99	36.715,1	7.203,5
Municipal Theatre	<ul style="list-style-type: none"> • Insulation • Replacement of old windows, doors and shutter assemblies • Energy monitoring and assessment systems 	67.959,95	5.447	1.068,70
15 th Primary School	<ul style="list-style-type: none"> • Replacement of old windows, doors and shutter assemblies • Improvement of the Lighting System • Energy monitoring and assessment systems 	80.411,04	15.782	3.096,42
1 st High School	<ul style="list-style-type: none"> • Replacement of old windows, doors and shutter assemblies 	136.585,0	27.688,26	5.432,44
Total		645.300	85.632,36	16.801,06

6.4.1.6. Energy Efficiency Measures in the Communal Facilities

This kind of intervention includes the implementation of various bioclimatic measures in Kountourioti square whose total area is 6.555 m². These measures include the installation of special tiles of high reflectivity, wooden posts and roof tiles, plantations and other bioclimatic material. The total budget for the implementation of the above measures is €154.700. Energy savings for this kind of intervention was not estimated.

²⁰ The price of KWh is estimated at the upper limit (€0,18+ VAT 9% per KWh) within the price range charged by PPC, since it is assumed that this benefit will come from the excess energy consumed, which is charged at the highest rate.

6.4.1.7. Energy Efficiency in Transportation

As far as the transportation sector is concerned, the municipal authority has included in its action plan an urban mobility survey which will focus on accessibility to particular places of the city, aiming to reduce the usage of private vehicles and fuels' savings. The total budget of the survey will be **€50.000,00**. The total benefit for Rhodes' Municipality, in terms of energy savings cannot be determined, however, it was estimated that the implementation of the study will reduce petrol consumed by private vehicles by 895.000 lt annually.

6.4.1.8. Energy Efficiency Dissemination, Awareness and Communication Plan in Rhodes

Rhodes' Municipality will bring into effect a dynamic and multidimensional communication plan including dissemination, networking and publicity actions regarding energy efficiency which will address Municipality's employees and citizens of Rhodes. The main objective of the dissemination plan is to influence the behavior of municipal employees and citizens towards more rational use of energy, so that to achieve energy savings.

Training and sensitization of municipal employees will be implemented in three different levels:

- Energy supervisors of buildings and facilities.
- Engineers / Technicians of Rhodes Municipality.
- Other Municipal Employees.

The dissemination strategy is implemented in three phases:

- First Phase: A generic awareness program will be developed, addressing total population by using various communication means such as direct mails, e-mails, meetings, conferences etc.
- Second Phase: The second phase aims to more specific target groups through the use of internet, publishing and distribution of brochures-newsletters - specified magazines, organization and implementation of workshops and conferences.
- Third Phase: The last phase aims to the dissemination of the program's output giving emphasis on publicity activities and increasing awareness regarding best practices. Some of the means that will be used are the internet, the utilization of the regional media, etc.

Although there are no technical / bibliographic data that could justify the energy savings achieved through more rational behavior, it is reasonable to assume that the impact of the improvement of awareness and sensitization of Municipal employees could reach 5% reduction of total energy consumption.

The total energy cost of the Rhodes Municipality was approximately 500.000 €/year in 2008, based on the Public Power Corporation's (PPC) official consumption data, coming from the Municipal Financial Department, as well as estimations made by the technicians of Rhodes Municipality. This figure included the energy consumption of buildings, public lighting, as well as the rest municipal facilities.

Therefore, based on the results of the dissemination plan, the energy savings of the municipal buildings and the facilities could reach 5% of the total energy consumption or $0,05 \cdot 500.000 \text{ €} / \text{year} = \mathbf{25.000 \text{ €}}$.

6.4.1.9. Preliminary Comments of the Energy Efficiency Action Plan of Rhodes' Municipality

The integrated energy efficiency action plan of Rhodes Municipality consists of 4 different categories of interventions (buildings, communal spaces, transport and awareness). Some of them have a direct impact on energy conservation and some of them may have an indirect impact which, either cannot be measured, or its measurement is based on assumptions regarding behaviors of people, as is the case for awareness / sensitization activities.

In addition, the interventions included in the action plan of Rhodes' Municipality have some peculiarities regarding the individual characteristics of the buildings renovated (such as the traditional character of the town hall and the city theatre), which raise the costs of renovation, while at the same time restrict the range of interventions to be undertaken.

Another issue to be mentioned is the integrated character of the action plan, since it combines various interventions implemented into various types of venues, aiming to improve the quality of life in the city. The benefits arisen from the implementation of this action plan could be categorized as following:

- **Environmental.** It is estimated that the implementation of this action plan will result to the reduction of CO₂ emissions by 62.026 kt annually. It should be noted that this is the direct impact on CO₂ emissions, not taking into consideration the indirect effect of other interventions undertaken. Improvements in communal spaces (bioclimatic interventions) improve the

microenvironment while they also improve the quality of life of the city's inhabitants.

- **Economic.** The directly measurable financial benefits for Municipality of Rhodes account to approximately €16.000 annually, while the indirect effect may reach €25.000 annually. In addition, it is estimated that through the implementation of urban mobility measures there will be a decrease of petrol consumption of approximately 895.000 lt annually (approximately €940.000 savings in today's petrol retail prices). Finally, the cost of interventions undertaken create a demand for projects of total value €1.000.000 (including VAT), thereby leveraging local economy.
- **Social.** There will be an increase of awareness on energy conservation issues, and increased sensitization of civilians regarding the necessity of personal involvement on environmental issues.

Taking into consideration the above, Rhodes' Municipality energy efficiency action plan is eligible for financing in the context of JESSICA, since it fulfills the basic criteria for sustainable urban development, by combining different categories of interventions which overall improve the quality of life in the city in an integrated way.

6.4.1.10. Financial Analysis

The purpose of financial analysis is to investigate the ability of Rhodes Municipality to repay the loan provided by a UDF, which will be established for the purpose of financing the implementation of energy efficiency plans of Municipal Authorities.

Within this context, financial analysis investigates whether energy savings arisen from the implementation of energy efficiency measures are adequate to repay the loan. However, since the energy efficiency action plan of Rhodes' Municipality consists of interventions that lead to particular savings (compensating interventions) and interventions that do not lead to specific savings (not compensating investments), it is critical to investigate all aspects of the energy efficiency action plan by developing alternative scenarios as follows:

- Investigation of the adequacy of direct and indirect energy savings to repay a loan based on total investment cost, not taking into consideration the grants provided by initiative "EXOIKONOMO" (100% financed by the UDF)
- Investigation of the adequacy of direct and indirect energy savings to repay a loan which will cover the own contribution of the Municipal Authority on total investment cost (30% financed by the UDF)

- Investigation of the adequacy of direct energy savings to repay a loan based only on the investment cost related to compensating interventions (100% financed by the UDF)
- Investigation of the adequacy of direct energy savings to repay a loan based only on the investment cost related to compensating interventions taking into consideration only own participation of Municipality (30% financed by the UDF).

Therefore, the alternative scenarios are based on the following variables:

- **The grant.** We investigate the extent to which Rhodes' Municipality will be able to repay a loan, through energy savings, if its action plan will not be financed by the initiative EXOIKONOMO, thereby creating a need for financing total investment cost.
- **The risk implied in the action plan.** We consider the degree of certainty of the cash flows (savings) generated by the action plan. Therefore, we distinguish two kinds of savings:
 - **Direct savings.** These savings that are directly attributable to specific interventions and according to measurements performed, we can be pretty sure that the energy savings will be achieved.
 - **Indirect savings.** These savings that can be generated through rationalization of behaviors or other savings that cannot be measured in the planning phase. These kinds of savings include a great degree of risk since they are based on assumptions regarding the impact of the relative interventions on energy conservation.
- **The investment cost.** We distinguish investments that have a direct impact on energy savings from these investments that have an indirect, or no impact on energy savings. Evaluation is performed on these investments that have a direct gain. Investments that do not generate validated gains are not included in the evaluation.

The above scenarios are analyzed based on the assumptions that the time period of the loan will be 15 years and the interest rate will be fixed at 3%. The total budget of the integrated action plan is €1.000.000 and is allocated as follows:

Table 9: Budget of Rhodes' Municipality Energy Efficiency Action Plan

Intervention	Budget	Compensating
Renovation of Town Hall	360.343,99	✓✓
Renovation of Municipal Theatre	67.959,95	✓✓

Intervention	Budget	Compensating
Renovation of 15 th Primary School	80.411,04	✓✓
Renovation of 1 st High School	136.585,0	✓✓
Bioclimatic applications in Communal Spaces	154.700	✓
Urban Mobility Study	50.000	✓
Dissemination	50.000	✓
Technical Assistance	100.000	
Total	1.000.000	

✓✓: Directly attributed savings

✓: Indirect or not measurable benefits

Therefore, the investment cost related to compensating interventions is €645.300.

The total grant that will be provided to Rhodes' Municipal Authority, will be €700.000 and the remainder amount should be covered by Municipality's own contribution.

Scenario 1 (no grant, direct and indirect financial gains)

Taking into consideration the basic assumptions related to loan terms (time and interest rate) and considering also that the action plan will be completed in a time framework of approximately 3 years, while the major compensating interventions will be completed in two years, the basic results of financial calculations are:

- Total financial gains are not adequate enough to repay the loan payments since the debt service coverage ratio is 50%. For achieving a DSCR of 100%, the debt should have a period of 24 years with 0% interest rate.
- In strictly financial terms, this investment is not profitable since NPV is negative (discount rate 3%) and IRR on equity iterate due to non significant cash flows as related to investment outflows.

Scenario 2 (70% grants, direct and indirect financial gains)

In this scenario, investment return is based on Municipality's own contribution, considering that 70% of the investment will be subsidized by the initiative

EXOIKONOMO. Therefore, financial ratios are calculated on investment cost €300.000. The basic results of this calculation are:

- Total financial gains are plenty enough to pay the annual payments of the loan. Debt service coverage ratio is 166%.
- Net present value is positive and IRR on equity is 8%. That means that in terms of Municipality's own contribution (Return on Equity), this is a profitable investment.

Scenario 3 (no grant, compensating investments, direct financial gains)

In this scenario, investment return is based on the investment cost of compensating interventions and financial gains include only those gains that are directly attributable to these specific interventions. In this case, essentially, it is assumed that Municipality will not benefit from EXOIKONOMO grants and it will finance these compensating investments with a loan. The results of these calculations are the following:

- Financial gains are not adequate enough to pay back loan payments. Debt coverage service ratio is only 31%. For achieving a DSCR of 100%, the debt should have a period of 38 years with 0% interest rate
- Net present value is negative and IRR on equity iterate due to non significant cash flows as related to investment outflows.

Scenario 4 (70% grant, compensating investments, direct financial gains)

In this scenario investment return is based on Municipality's own contribution on the investment cost that is directly related to compensating investments, since 70% of this investment will be financed by "EXOIKONOMO". Financial gains are directly attributable to these investments. In this case, essentially, it is assumed that Municipality will benefit from EXOIKONOMO grants, only for those investments that produce specific savings, while its own contribution will count for 30% of the above amount. The results of these calculations are the following:

- Financial gains marginally cover the debt payments since DSCR is 104%
- In terms of return, IRR on equity is marginally 0% and NPV is marginally negative.

We also ran each particular scenario with the assumption that the project will be financed by a commercial loan instead of JESSICA loan, with interest rate 6,4%. The

following table 10 summarize the main findings of scenario analysis and tables 11-18 illustrate the analytical calculations for each scenario:

Table 10: Summary of the findings of scenarios financial analysis

		JESSICA loan		Commercial loan	
	IRR Project	DSCR	IRR equity	DSCR	IRR equity
Scenario 1	-4,8%	49,9%	Iterate	39,6%	iterate
Scenario 2	9,4%	166,3%	8,3%	131,9%	5,0%
Scenario 3	-9,9%	31,1%	Iterate	24,6%	Iterate
Scenario 4	3,5%	103,6%	0,5%	82,1%	-3,3%

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Table 11: Financial Analysis of Scenario 1 - JESSICA Loan

Scenario 1			Interest Rate	Loan duration	Principal Capital												
			3%	15	1.000.000,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-200.000,00	-600.000,00	-200.000,00														
Energy Savings			41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €
Loan payments			83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €	83.766,58 €
Interest			30.000,00 €	28.387,00 €	26.725,62 €	25.014,39 €	23.251,82 €	21.436,38 €	19.566,47 €	17.640,47 €	15.656,68 €	13.613,39 €	11.508,79 €	9.341,06 €	7.108,29 €	4.808,54 €	2.439,80 €
Paid back capital			53.766,58 €	55.379,58 €	57.040,97 €	58.752,19 €	60.514,76 €	62.330,20 €	64.200,11 €	66.126,11 €	68.109,90 €	70.153,19 €	72.257,79 €	74.425,52 €	76.658,29 €	78.958,04 €	81.326,78 €
Loan balance			946.233,42 €	890.853,84 €	833.812,88 €	775.060,68 €	714.545,92 €	652.215,72 €	588.015,61 €	521.889,50 €	453.779,60 €	383.626,41 €	311.368,62 €	236.943,10 €	160.284,81 €	81.326,78 €	-0,00 €
Cash Flow to Equity	-200.000,00	-600.000,00	-188.198,94 €	13.414,06 €	15.075,44 €	16.786,67 €	18.549,24 €	20.364,68 €	22.234,59 €	24.160,59 €	26.144,38 €	28.187,67 €	30.292,27 €	32.460,00 €	34.692,77 €	36.992,52 €	39.361,26 €
DSCR		50%															
IRR		#NUM!															
Net Present value		-676.923,33 €															
Project IRR		-4,8%															

Table 12: Financial Analysis of Scenario 2 – JESSICA Loan

Scenario 2			Interest Rate	Loan duration	Principal Capital													
			3%	15	300.000,00 €													
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	
Investment Costs	-60.000,00	-180.000,00	-60.000,00															
Energy Savings			41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	
Loan payments			25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	25.129,97 €	
Interest			9.000,00 €	8.516,10 €	8.017,68 €	7.504,32 €	6.975,55 €	6.430,91 €	5.869,94 €	5.292,14 €	4.697,01 €	4.084,02 €	3.452,64 €	2.802,32 €	2.132,49 €	1.442,56 €	731,94 €	
Paid back capital			16.129,97 €	16.613,87 €	17.112,29 €	17.625,66 €	18.154,43 €	18.699,06 €	19.260,03 €	19.837,83 €	20.432,97 €	21.045,96 €	21.677,34 €	22.327,66 €	22.997,49 €	23.687,41 €	24.398,03 €	
Loan balance			283.870,03 €	267.256,15 €	250.143,86 €	232.518,20 €	214.363,78 €	195.664,72 €	176.404,68 €	156.566,85 €	136.133,88 €	115.087,92 €	93.410,59 €	71.082,93 €	48.085,44 €	24.398,03 €	-0,00 €	
Cash fow to equity	-60.000,00	-180.000,00	-27.198,94 €	33.284,96 €	33.783,38 €	34.296,74 €	34.825,51 €	35.370,15 €	35.931,12 €	36.508,92 €	37.104,05 €	37.717,04 €	38.348,42 €	38.998,74 €	39.668,57 €	40.358,50 €	41.069,12 €	
DSCR		166%																
IRR		8%																
Net Present value	189.969,37 €																	
Project IRR	9,4%																	

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Table 13: Financial Analysis of Scenario 3 – JESSCIA Loan

Scenario 3			Interest Rate	Loan duration	Principal Capital												
			6,4%	15	645.300,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-45.300,00	-600.000,00															
Energy Savings			16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €
Loan payments			68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €
Interest			41.299,20 €	39.578,24 €	37.747,13 €	35.798,84 €	33.725,85 €	31.520,20 €	29.173,38 €	26.676,36 €	24.019,54 €	21.192,68 €	18.184,90 €	14.984,62 €	11.579,52 €	7.956,50 €	4.101,61 €
Paid back capital			26.890,04 €	28.611,00 €	30.442,10 €	32.390,40 €	34.463,38 €	36.669,04 €	39.015,86 €	41.512,88 €	44.169,70 €	46.996,56 €	50.004,34 €	53.204,62 €	56.609,71 €	60.232,73 €	64.087,63 €
Loan balance			618.409,96 €	589.798,96 €	559.356,86 €	526.966,46 €	492.503,07 €	455.834,03 €	416.818,17 €	375.305,29 €	331.135,60 €	284.139,04 €	234.134,70 €	180.930,08 €	124.320,36 €	64.087,63 €	0,00 €
Cash flow to equity	-45.300,00	-600.000,00	-24.498,14 €	-22.777,18 €	-20.946,07 €	-18.997,78 €	-16.924,79 €	-14.719,14 €	-12.372,32 €	-9.875,30 €	-7.218,48 €	-4.391,62 €	-1.383,84 €	1.816,44 €	5.221,54 €	8.844,56 €	12.699,45 €
DSCR		25%															
IRR		#DIV/0!															
Net Present value		-420.481,70 €															
Project IRR		-9,9%															

Table 14: Financial Analysis of Scenario 4 – JESSICA Loan

Scenario 4			Interest Rate	Loan duration	Principal Capital												
			3%	15	193.590,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-13.590,00	-180.000,00															
Energy Savings			16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €
Loan payments			16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €	16.216,37 €
Interest			5.807,70 €	5.495,44 €	5.173,81 €	4.842,54 €	4.501,32 €	4.149,87 €	3.787,87 €	3.415,02 €	3.030,98 €	2.635,42 €	2.227,99 €	1.808,34 €	1.376,09 €	930,89 €	472,32 €
Paid back capital			10.408,67 €	10.720,93 €	11.042,56 €	11.373,84 €	11.715,05 €	12.066,50 €	12.428,50 €	12.801,35 €	13.185,39 €	13.580,96 €	13.988,39 €	14.408,04 €	14.840,28 €	15.285,49 €	15.744,05 €
Loan balance			183.181,33 €	172.460,40 €	161.417,83 €	150.044,00 €	138.328,95 €	126.262,44 €	113.833,94 €	101.032,59 €	87.847,19 €	74.266,24 €	60.277,85 €	45.869,81 €	31.029,54 €	15.744,05 €	-0,00 €
Cash flow to equity	-13.590,00	-180.000,00	10.993,36 €	11.305,62 €	11.627,25 €	11.958,52 €	12.299,74 €	12.651,19 €	13.013,19 €	13.386,04 €	13.770,08 €	14.165,64 €	14.573,07 €	14.992,72 €	15.424,97 €	15.870,17 €	16.328,74 €
DSCR	104%																
IRR	0,5%																
Net Present value	-33.401,01 €																

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Table 15: Financial Analysis of Scenario 1 – Commercial Loan

Scenario 1			Interest Rate	Loan duration	Principal Capital												
			6,4%	15	1.000.000,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-200.000,00	-600.000,00	-200.000,00														
Energy Savings			41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €
Loan payments			105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €	105.670,60 €
Interest			64.000,00 €	61.333,08 €	58.495,48 €	55.476,27 €	52.263,84 €	48.845,80 €	45.209,02 €	41.339,47 €	37.222,28 €	32.841,59 €	28.180,53 €	23.221,17 €	17.944,41 €	12.329,93 €	6.356,13 €
Paid back capital			41.670,60 €	44.337,52 €	47.175,12 €	50.194,33 €	53.406,76 €	56.824,80 €	60.461,58 €	64.331,13 €	68.448,32 €	72.829,01 €	77.490,07 €	82.449,43 €	87.726,19 €	93.340,67 €	99.314,47 €
Loan balance			958.329,40 €	913.991,88 €	866.816,76 €	816.622,43 €	763.215,67 €	706.390,87 €	645.929,29 €	581.598,16 €	513.149,85 €	440.320,84 €	362.830,77 €	280.381,34 €	192.655,14 €	99.314,47 €	0,00 €
Cash Flow to Equity	-200.000,00	-600.000,00	-222.198,94 €	-19.532,02 €	-16.694,42 €	-13.675,21 €	-10.462,78 €	-7.044,74 €	-3.407,96 €	461,59 €	4.578,78 €	8.959,47 €	13.620,53 €	18.579,89 €	23.856,65 €	29.471,13 €	35.444,93 €
DSCR		40%															
IRR		#DIV/0!															
Net Present value		-898.978,14 €															
Project IRR		-4,8%															

Table 16: Financial Analysis of Scenario 2 – Commercial Loan

Scenario 2			Interest Rate	Loan duration	Principal Capital												
			6,4%	15	300.000,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-60.000,00	-180.000,00	-60.000,00														
Energy Savings			41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €	41.801,06 €
Loan payments			31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €	31.701,18 €
Interest			19.200,00 €	18.399,92 €	17.548,64 €	16.642,88 €	15.679,15 €	14.653,74 €	13.562,70 €	12.401,84 €	11.166,68 €	9.852,48 €	8.454,16 €	6.966,35 €	5.383,32 €	3.698,98 €	1.906,84 €
Paid back capital			12.501,18 €	13.301,26 €	14.152,54 €	15.058,30 €	16.022,03 €	17.047,44 €	18.138,48 €	19.299,34 €	20.534,50 €	21.848,70 €	23.247,02 €	24.734,83 €	26.317,86 €	28.002,20 €	29.794,34 €
Loan balance			287.498,82 €	274.197,56 €	260.045,03 €	244.986,73 €	228.964,70 €	211.917,26 €	193.778,79 €	174.479,45 €	153.944,95 €	132.096,25 €	108.849,23 €	84.114,40 €	57.796,54 €	29.794,34 €	0,00 €
Cash flow to equity	-60.000,00	-180.000,00	-37.398,94 €	23.401,14 €	24.252,42 €	25.158,18 €	26.121,91 €	27.147,32 €	28.238,36 €	29.399,22 €	30.634,38 €	31.948,58 €	33.346,90 €	34.834,71 €	36.417,74 €	38.102,08 €	39.894,22 €
DSCR		132%															
IRR		5%															
Net Present value		33.295,46 €															
Project IRR		9,4%															

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Table 17: Financial Analysis of Scenario 3 – Commercial Loan

Scenario 3			Interest Rate	Loan duration	Principal Capital												
			6,4%	15	645.300,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-45.300,00	-600.000,00															
Energy Savings			16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €
Loan payments			68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €	68.189,24 €
Interest			41.299,20 €	39.578,24 €	37.747,13 €	35.798,84 €	33.725,85 €	31.520,20 €	29.173,38 €	26.676,36 €	24.019,54 €	21.192,68 €	18.184,90 €	14.984,62 €	11.579,52 €	7.956,50 €	4.101,61 €
Paid back capital			26.890,04 €	28.611,00 €	30.442,10 €	32.390,40 €	34.463,38 €	36.669,04 €	39.015,86 €	41.512,88 €	44.169,70 €	46.996,56 €	50.004,34 €	53.204,62 €	56.609,71 €	60.232,73 €	64.087,63 €
Loan balance			618.409,96 €	589.798,96 €	559.356,86 €	526.966,46 €	492.503,07 €	455.834,03 €	416.818,17 €	375.305,29 €	331.135,60 €	284.139,04 €	234.134,70 €	180.930,08 €	124.320,36 €	64.087,63 €	0,00 €
Cash flow to equity	-45.300,00	-600.000,00	-24.498,14 €	-22.777,18 €	-20.946,07 €	-18.997,78 €	-16.924,79 €	-14.719,14 €	-12.372,32 €	-9.875,30 €	-7.218,48 €	-4.391,62 €	-1.383,84 €	1.816,44 €	5.221,54 €	8.844,56 €	12.699,45 €
DSCR		25%															
IRR		#DIV/0!															
Net Present value		-432.122,85 €															
Project IRR		-9,9%															

Table 18: Financial Analysis of Scenario 4 – Commercial Loan

Scenario 4			Interest Rate	Loan duration	Principal Capital												
			6,4%	15	193.590,00 €												
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17
Investment Costs	-13.590,00	-180.000,00															
Energy Savings			16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €	16.801,06 €
Loan payments			20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €	20.456,77 €
Interest			12.389,76 €	11.873,47 €	11.324,14 €	10.739,65 €	10.117,76 €	9.456,06 €	8.752,01 €	8.002,91 €	7.205,86 €	6.357,80 €	5.455,47 €	4.495,39 €	3.473,86 €	2.386,95 €	1.230,48 €
Paid back capital			8.067,01 €	8.583,30 €	9.132,63 €	9.717,12 €	10.339,02 €	11.000,71 €	11.704,76 €	12.453,86 €	13.250,91 €	14.098,97 €	15.001,30 €	15.961,39 €	16.982,91 €	18.069,82 €	19.226,29 €
Loan balance			185.522,99 €	176.939,69 €	167.807,06 €	158.089,94 €	147.750,92 €	136.750,21 €	125.045,45 €	112.591,59 €	99.340,68 €	85.241,71 €	70.240,41 €	54.279,02 €	37.296,11 €	19.226,29 €	0,00 €
Cash flow to equity	-13.590,00	-180.000,00	4.411,30 €	4.927,59 €	5.476,92 €	6.061,41 €	6.683,30 €	7.345,00 €	8.049,05 €	8.798,15 €	9.595,20 €	10.443,26 €	11.345,59 €	12.305,67 €	13.327,20 €	14.414,11 €	15.570,58 €
DSCR		82%															
IRR		-3,3%															
Net Present value	-101.871,61 €																
Project IRR		3,5%															

6.4.1.11. Concluding Remarks

The utilization of JESSICA for financing energy efficiency action plans of Municipal Authorities as a complementary means in the context of EXOIKONOMO initiative, seems to fit well into the overall philosophy of JESSICA as a financing instrument of integrated urban development.

Complementary projects that contribute to the improvement of quality of life, combining also the environmental, economic and social aspect of sustainability seem to be the critical factors that validate the eligibility of such interventions within the JESSICA framework.

Financial analysis illustrates that grants provided in the context of EXOIKONOMO are critical for financing energy efficiency interventions of Rhodes' Municipality. Cash flow forecasts show that energy savings are not sufficient to pay back the overall investment while ROI is negative.

However, when the investment is appraised in the context of Municipality's own contribution, then cash flow is sufficient to repay debt and return on investment is positive. There is, however, great risk involved because cash flows include savings that are questionable.

The same conclusions arise when we incorporate into the financial model only the compensating projects. A 100% financing by UDF does not seem to be feasible since cash flows are not sufficient to pay back debt and ROI is negative. When we take into consideration that the projects are 70% financed by grants and 30% by UDF then IRR is zero, while cash savings are marginally sufficient to pay back the debt. In this case, however, the projected savings are safer, since they are based on more precise measurements.

Certainly, the peculiarities of the particular interventions undertaken by Rhodes Municipality should be taken into consideration when appraising financial performance. Statements like, "*the action plans that will be submitted in the context of EXOIKONOMO illustrate low ROI*" constitute oversimplification and should be avoided, since each action plan will have its own characteristics regarding the compensating character of the interventions undertaken.

It is very reasonable to assume that Municipal Authorities may include in their action plans projects that are less compensating than others. The issues to be investigated is the total savings projected, the degree of risk inherent in these savings and the overall

financial capability of Municipal Authorities to pay back their obligations to UDF if results are not as expected.

6.4.2 CASE STUDY 2: The Green Energy Plan in Corfu Community: Energy Efficiency Measures in Commerce and Service Shops

6.4.2.1. Introduction

The purpose of this case study is to illustrate the potential of implementing JESSICA in the energy efficiency sector in Greece. It is based on a genuine initiative undertaken by a joint venture consisting of various private and public agencies. This initiative consists of two major projects:

- Planning and Implementation of energy efficiency measures in small commerce and service shops (operating on venues less than 100 sq met)
- Planning, construction and operation of a Combined Heat and Power (CHP – or widely known as “Cogeneration”) plant for producing electricity and heat, fuelled by local biomass.

This initiative is in the planning phase and was submitted for financing in the context of Global Grants.

This case was chosen, because it contains a pure energy efficiency intervention, addressing also local energy capacity issues as well as urban development. Some of the things that drew special attention were the organizational scheme under which the projects are organized, the synergetic effects of the various partners and finally the introduction of third party financing mechanisms through the establishment of an Energy Services Company.

The following sections discuss briefly the overall environment within which the project was planned, the organizational scheme, the output to be delivered and the expected benefits.

Based on the dataset described above, the consultant develops a framework under which the JESSICA instrument could be implemented, in order to finance -in the form of loans- the energy efficiency interventions.

Then, an integrated financial analysis²¹ is performed in order to illustrate whether, under the specific circumstances, the energy efficiency interventions are feasible in financial terms and the financial benefits are sufficient enough to cover the repayments of loans.

Finally, an additional financial analysis is performed so that to investigate the operational cash flow of the potential UDF and to identify the resources returned at the end of its life.

This case study closes with the concluding remarks regarding the overall evaluation of the applicability of JESSICA, and the issues to be dealt with in the future.

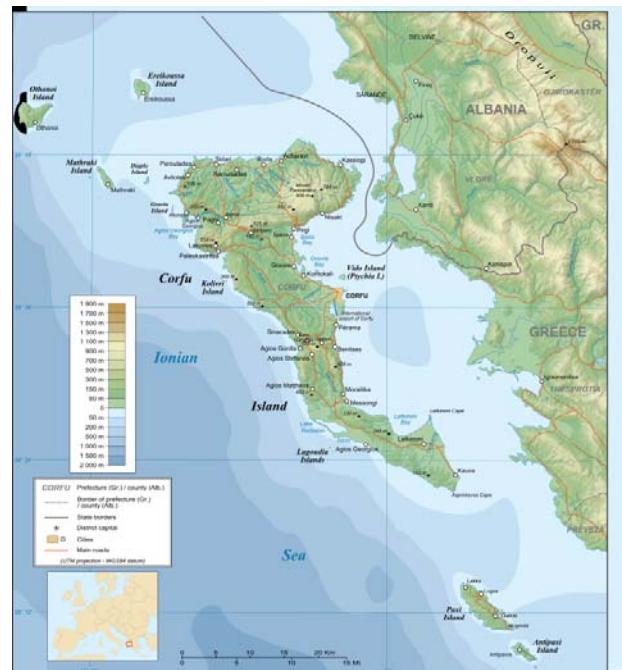
6.4.2.2. The Project Environment

General Statistics

Corfu is the second biggest island in the Ionian Sea. The main island is part of the Corfu Prefecture and includes twelve of the sixteen municipalities and communes of the Prefecture (Ereikoussa, Mathraki, Othonoi, and Paxoi, are all separate islands).

The main demographic and economic characteristics of the Corfu Island are the following:

- Area (sq.km): 641
- Population (2001): 113.479
- Population Density (hab/sq.km): 177
- Capital City: Kerkyra (Corfu)
- Number of Hotels: 406
- Number of hotel Rooms: 23.447
- Number of hotel beds: 44.333
- Number of total accommodation: 88.351 beds
- Number of enterprises: 14.000
- Number of tourists arrivals²²: 555.539
- Number of nights spent: 4.158.743



²¹ Financial analysis is performed only for energy efficiency interventions. Financial data for the CHP plant are not available because the appropriate preparatory studies have not been executed yet. It is expected that within the following year all relevant preparatory studies will be completed and the project will be more mature for financing. Therefore, the financial analysis of CHP plant, if performed, would be based on assumptions that might be proven false and disorient the findings of the evaluation study.

²² 2007

Economy

The economy of Corfu is mostly based on tourism and agriculture. Services²³ and commerce are dependant to a large extend on tourism activity. The total number of enterprises established and operating in Corfu are 14.000, 50% of which are in the commerce and service sectors and employ 50% of the domestic population.

As far as the agricultural activity is concerned, Corfu is mostly planted with olive groves and vineyards and has been producing olive oil and wine since antiquity. Indeed, the impressive vegetation of the island consists mainly of olive and cypress trees, (about 4 million olive trees) which are planted by the Venetian period 13th - 18th century. As a result, olive oil is the leading product of the island and is considered to be among the best in Greece. Other products are milk, butter, cheese, white wine and processed meat.

It should be noted that, two thirds of the population generate income from agricultural activities, mainly from olive trees. There are also in the island 136 oil-press venues, whose production methods are obsolete and they do not apply modern waste management techniques.

Environment & Energy

The main characteristics of the Island of Corfu regarding energy and environment are the following:

- Corfu's energy demand is strictly dependant on the mainland's generation capacity
- The island lacks RES production capacity
- There is an increasing pressure on the environment due to: the penetration of urban activities in non-urban areas, the increasing construction activities and the lack of a consistent framework for locating manufacturing facilities.
- There is a seasonal pressure to energy demand because of the intense tourism activity during the period May – September, which results to supply – demand deficit.

²³ With the term "service sector" it is meant companies that address every day needs of the consumers such as hairdressers, restaurants etc.

6.4.2.3. Background of the Project

The small size of commerce and service companies, as well as the lack of standardization of lighting equipment, combined with the dominant view of local entrepreneurs that lighting is a major means for sales promotion, are the most prohibitive factors for providing energy services to these companies, despite the fact that commerce and service are the least efficient sectors in terms of energy consumption. Indicatively, commerce and service shops consume approximately 75% of total energy demand in the island of Corfu. Additionally, these companies, due to their size, do not have the appropriate advisory and technical support in energy related issues.

It is estimated that the total number of commerce and service companies occupying space less than 100 sq meters, are 3.000, 1.300 of which, are directly related to the incoming tourism (selling souvenirs and other products and services related to tourism). These companies constitute the main beneficiary group of the project.

Additionally, due to the sizeable volume of olive trees, there is an emergent opportunity for exploiting the local olive feedstock as combustion material for establishing a biomass plant for producing electricity and heating, thereby expanding the energy capacity of the island and reducing its dependency on traditional and polluting forms of energy.

The project has been submitted for financing under the global grants scheme aiming to:

- rational utilization of energy resources
- reduction of Corfu's dependency on traditional forms of energy
- boosting local development.

The application for grant was submitted by a joint venture of various agencies (professional associations, local authorities, private enterprises) led by the Chamber of Corfu.

The managing authority of Regional Operational Program of Ionian Islands decided to finance only the preparatory studies of the project which will specify the major interventions. The core activities of the project will be financed by the NSRF following the completion of the preparatory studies. The tender for the assignment of the preparatory studies is in progress.

6.4.2.4. Interventions Planned

The core project constituents are:

- Planning and implementation of energy efficiency interventions, with a main focus on lighting, in 3.000 commerce and service shops.
 - Determination of Eligibility criteria for participating companies
 - Creation of Participating companies' shortlist
 - Development of third party financing contracts
 - Performance of energy audits
 - Implementation of energy efficiency measures
- Establishment of a new agency (Active Retailers) which will undertake the implementation of energy efficiency measures and the establishment & operation of the cogeneration plant
- Establishment of the cogeneration plant utilizing local olive feedstock as combustible material.
 - Detection of available capacity
 - Identification of potential locations of the plant and selection of the best alternative
 - Licensing of the plant
 - Construction of the plant
 - Operation and supply of electricity and heating
- Planning and Implementation of Communication and Dissemination activities
 - Conferences
 - Documentaries
 - Press conferences
 - Sponsorships

A number of preparatory activities will be implemented in order to mature the core project activities, namely:

- Study for defining the specifications of energy efficiency improvements in small commerce and service companies and determination of eligibility criteria

- Creation of a data base with data regarding the companies that will be eligible for energy efficiency interventions
- Compilation of an action plan for the implementation and financing of the project
- Feasibility study for the construction of the biomass plant.
- Organizational study for the establishment of the Company “Active Retailers”
- Compilation of a training program regarding energy efficiency addressing the needs of electrical contractors
- Communication and Dissemination plan.

The initial budget of the project is €25,16 mil. This amount is allocated as follows:

Table 19: Budget of Corfu’s Energy Efficiency Action Plan

Activities	Budget (mil €)
Preparatory studies	1,6
Training of electrical contractors	0,3
Establishment of company “Active Citizens”	0,16
Implementation of energy efficiency measures in small commerce and service companies	15
Licensing, construction and operation of CHP unit	6,5
Organization of conferences	0,6
Documentaries	1
Total	25,16

As mentioned before, the project has been submitted to the Global Grants Scheme, in the context of 3rd Community Support Framework. The financing scheme was the following:

Table 20: The Financing Scheme of Corfu’s Energy Efficiency Action Plan

Activities	Public Expenditure (mil €)	Private Contribution (mil €)	Total Budget (mil €)
Preparatory studies	0,48	1,12	1,6
Training of electrical contractors	0,09	0,21	0,3
Establishment of company “Active Citizens”	0,048	0,112	0,16
Implementation of energy efficiency measures in small commerce and service companies	4,5	10,5	15
Licensing, construction and operation of CHP unit	2,6	3,9	6,5
Organization of conferences	0,18	0,42	0,6
Documentaries	0,3	0,7	1
Total	8,198	16,962	25,16

The time-frame within which the project will be implemented is 6 years and the budget is allocated as following:

Table 21: Timetable of Corfu's Energy Efficiency Action Plan

Activities	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Preparatory studies	1,6					
Training of electrical contractors	0,1	0,1	0,05	0,05		
Establishment of company "Active Retailers"		0,16				
Implementation of energy efficiency measures in small commerce and service companies		3	4,5	4,5	3	
Licensing, construction and operation of CHP unit		0,5	1,5	3,5	1	
Organization of conferences		0,2		0,2		0,2
Documentaries		0,2	0,2	0,2	0,2	0,2
Total	1,7	4,16	6,25	8,45	4,2	0,4

6.4.2.5. The Organizational Scheme of the Project (Participants and Roles)

The organizational scheme of the project ensures the timely and efficient implementation, as well as the dissemination of results by involving various agencies having specific roles according to their field of expertise.

The main philosophy of the organizational scheme is based on the implementation of two projects (as discussed before):

- The implementation of energy efficiency measures in small commerce and service companies (based on venues less than 100 m²) – **PROJECT A**
- The construction and operation of a cogeneration plant fuelled by local biomass – **PROJECT B.**

In organizational terms, the implementation of these two projects is relied on the establishment of a multi-shareholders' Energy Services Company²⁴ (ESCO) which will undertake a leadership role in running all stages of the projects: from planning and initiation to operation. The ESCO will benefit from the revenue stream generated by energy efficiency initiatives. These resources will be invested in the establishment of the cogeneration plant, covering partly its private contribution.

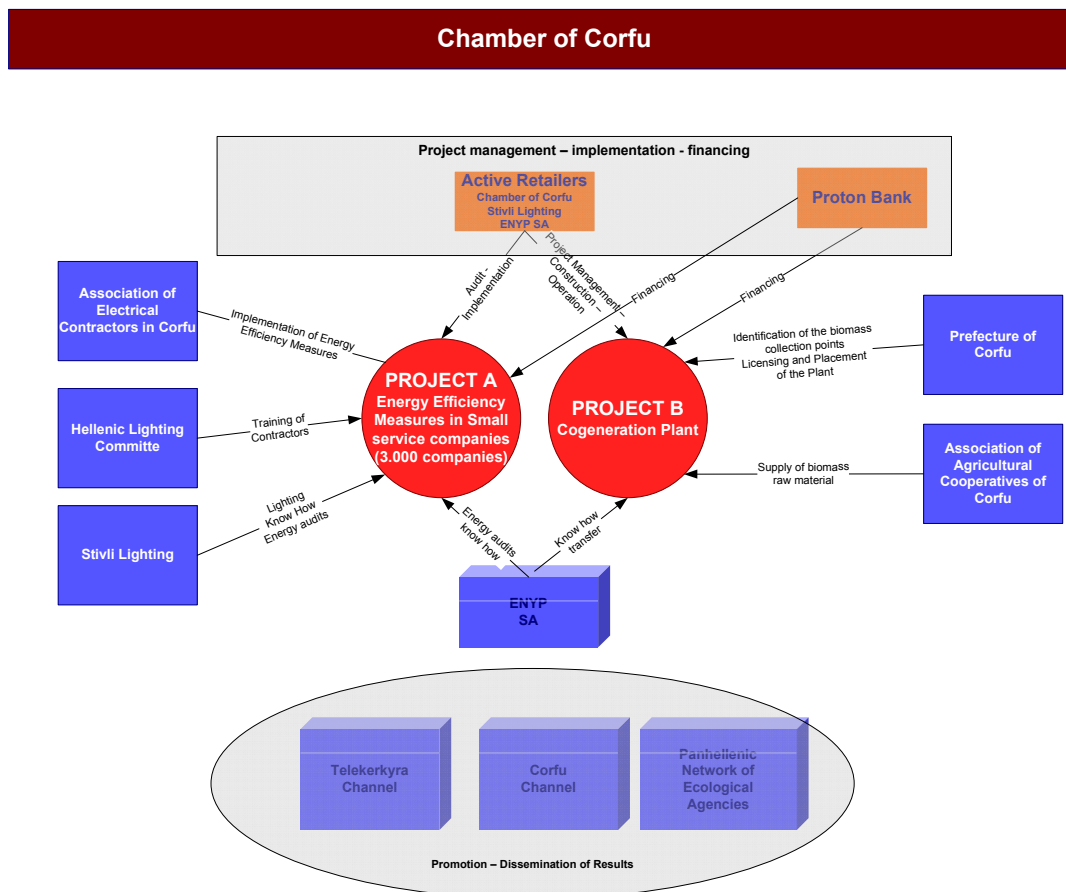
²⁴ "Active Retailers"

Participants of the project will provide their know-how, according to their field of expertise, whereas, private companies participating in the project will also be shareholders in the ESCO.

Small commerce and service companies will have the option to acquire shares in “Active Retailers” by offsetting their energy efficiency savings.

The following graph illustrates the involved agencies and the inputs provided in the context of the project:

Illustration 6: The Organizational Scheme of the Project



The role of each involved agency is analyzed as follows:

- ♦ **Chamber of Corfu:** Is the Project leader and initiator, supporting the green energy business plan and the development of the financing mechanism. The Chamber will be the founder and shareholder of the ESCO Company “Active Retailers”.

- ♦ **Prefecture of Corfu:** The Prefecture of Corfu will investigate and recommend appropriate places, where biomass resources (agricultural residue, etc.) will be collected as well as used for electricity and thermal production, covering partly the island's energy needs. The prefecture is also the competent body for issuing the appropriate licenses and for advising regarding the most appropriate location of establishment.
- ♦ **Association of Electrical Contractors in Corfu:** The Association will implement the energy efficiency measures in the electrical installations of small shops.
- ♦ **Association of Agricultural Cooperatives in Corfu:** It will be responsible for the collection and distribution of raw material that will be utilized as combustible material.
- ♦ **Hellenic Lighting Committee:** It will be responsible both for the electrical contractors' training and the organization of conferences and dissemination events.
- ♦ **Stivli Lighting SA:** The Company will develop the technical specifications that are related to the energy saving of lighting sector. It will have a share in "Active Retailers"
- ♦ **Pan-Hellenic Network of Ecological Agencies:** The network will support the dissemination of the project results and the participation of the citizens in the project events.
- ♦ **ENYP SA:** The Company will be responsible for the implementation of the energy audits as well as the design of the CHP biomass unit. It will have a share in "Active Retailers".
- ♦ **TELEKERKYRA CHANNEL SA & CORFU CHANNEL SA:** The regional channels will support the communication strategy of the project.

The financial scheme of the project is described as follows:

- ♦ The "**ESCO financial scheme**" will be used for the energy efficiency plan. In particular, an Energy Services Company - ESCO (**Active Retailers**) will be established. This company will be dedicated to the provision of energy services including energy appraisals, financing, planning, implementation and management of energy efficiency projects. The savings in energy costs will be used to pay back the capital investment of the project over a 7 years period, and reinvested into the cogeneration plant.

- ♦ ProtonBank bank will be the financial consultant in current project and will examine the best possible solution so that to support appropriately the funding of “Active Retailers”.
- ♦ In addition, the construction of the cogeneration plant will use the “leasing option” that will be supported by ProtonBank.

6.4.2.6. Benefits – the integrated character

The overall project aims to establish an integrated platform for energy independence of the island of Corfu, thereby contributing to:

- Environmental protection
- SMEs competitiveness’ improvement
- Sustainable Development
- Utilization of local resources

The main benefits of the project as described in the application of the joint venture are the following²⁵:

- ♦ The energy saving from the implementation of energy efficiency measures in small commerce and service companies is estimated to be more than 25.000 MWh per year and the reduction of CO₂ emissions is estimated to be ~11.000 tonnes per year.
- ♦ The capacity of the CHP plant, based on the local biomass potential, is estimated to be at least 25.000 MWh annually, while the reduction of CO₂ emissions is estimated to be ~11.000 tonnes per year
- ♦ Improvement of small businesses competitiveness, since the rationalization of their expenditure will improve their profitability
- ♦ Utilization of oil-press waste, thereby contributing to the improvement of environment, as well as to the improvement of peasants’ income (by selling the biomass to the CHP plant).
- ♦ Enhancement of women’s participation in the labour market, since more than 70% of the labour employed in small commerce and service companies are women

²⁵ Energy conservation benefits and financial analysis are based on assumptions – estimations as these were reported in the documents submitted by the joint venture. The consultant, based on these estimations performed the analysis.

- ♦ Improvement of electrical contractors' revenue and potential increase of employment in this particular sector
- ♦ Upgrade of retail shops in the historical center of the city of Corfu which is expected to be acknowledged as a global cultural heritage monument by UNESCO, thereby contributing to the increase of urban tourism and the increase of revenue stream of these businesses.

6.4.2.7. Implementation of JESSICA Instrument

Financial analysis is based on the estimations of the joint venture regarding energy savings accomplished through the energy efficiency measures undertaken.

As far as the energy efficiency measures are concerned, the initial estimation of the joint venture is for annual savings of 25 mil KWh. Based on the pricing of PPC (DEI) which is the sole provider of energy to the end consumer in Greece²⁶, it is estimated that the average cost per KWh for commerce and service sector companies is at least 0,103 € / KWh. Therefore, the total monetary benefit is 25.000.000 KWh x €0,103 / KWh= **€2.575.000 annually**. Taking into consideration the allocation of the budget addressing the energy efficiency measures (€4,5 mil grants and €10,5 mil private contribution) the purpose of this analysis is to illustrate in financial terms, how private contribution could be financed by a loan.

Financing the energy efficiency project – Organizational Approach

The initial plan of the project was to finance private contribution through a third party financing mechanism, according to which, "Active Retailers", as an ESCO, would undertake the responsibility of financing the individual energy efficiency measures in each company bearing the technical and financial risk.

However, due to state-aid regulations, this does not seem to be feasible in this case, because if ESCO would borrow money from the fund then it would automatically be considered as beneficiary (according to the regulation No 1083/2006) and it would fall within de minimis rule. Therefore, in order to overcome the obstacle of state-aid restrictions, the solution is to provide individual loans to each company through an Urban Development Fund, which will be established by the Chamber of Corfu.

The Chamber of Corfu will be the fund initiator and the competent entity against the Holding Fund and Central Administration for dispersing the funds as promised. Chamber

²⁶ PPC has a dominant position as a state monopoly as far as the distribution of electricity is concerned, however the production of electricity has been deregulated.

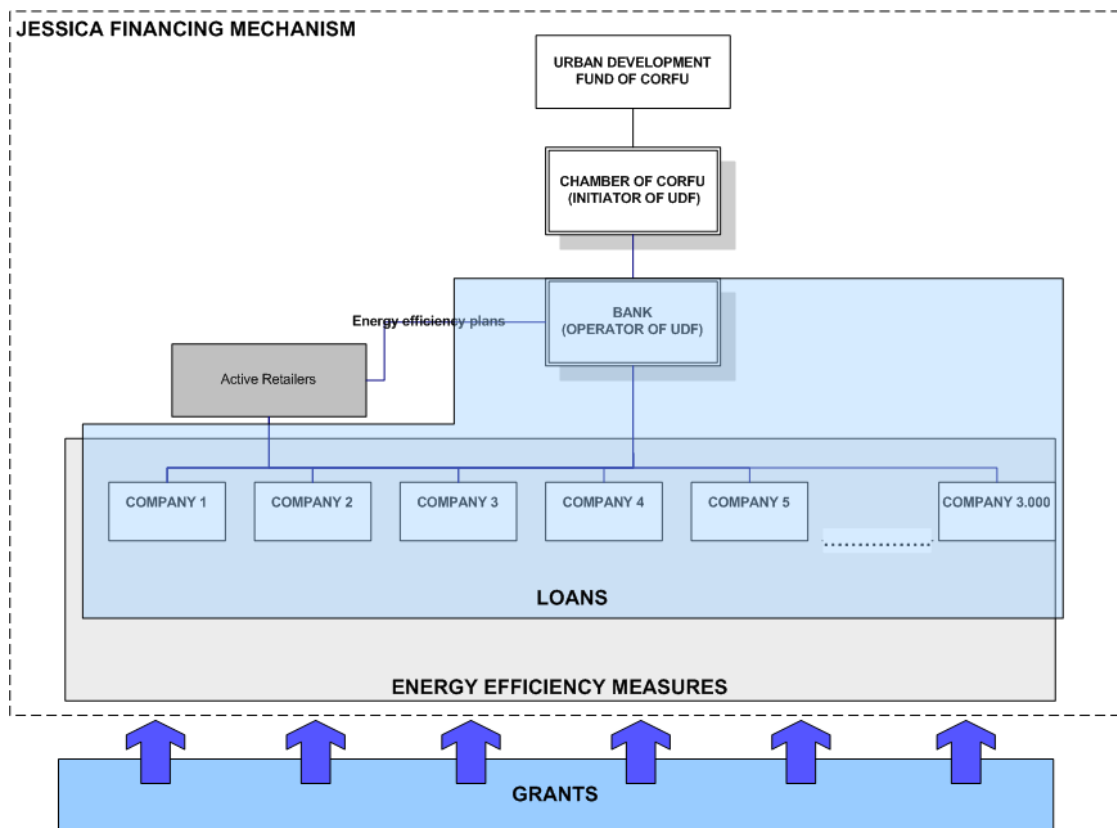
of Corfu will get into a management agreement with a bank which will be the operator of the UDF. The bank's responsibility will be to evaluate and monitor investments and to ensure the repayment of the loans. A basic requirement for financing each small company will be the submission of an energy efficiency plan, describing sufficiently the energy efficiency measures undertaken (including budget and time schedule) and the monetary benefits.

Chamber of Corfu will guarantee the transparency of the whole process and will ensure that loans will be provided according to the terms and conditions set.

"Active Retailers" will guarantee for the annual energy savings by establishing agreements with small companies through which it will gain a percentage of annual savings for the services provided (energy audits, planning and project management). As initially planned, the duration of this agreement will be 7 years and "Active Retailers" will generate an income for 7 years equal to a "success fee" based on annual energy savings.

The following chart illustrates the operational processes of the UDF as far as the energy efficiency measures are concerned.

Illustration 7: The UDF mechanism in the case of Corfu



Financial Analysis

Assumptions

The initial plan of project A regards the implementation of energy efficiency measures in 3.000 small companies, whereas total budget is €15 mil. This amount is allocated on average to €5.000 per company and total grant (€4,5 mil) is allocated to €1.500 per company. Thus, private contribution is estimated to €3.500 per company.

The following table illustrates the basic dataset for performing the financial analysis of the project:

Table 22: Basic Financial Assumptions

Measure	Value
Average investment per company (€)	€5.000
Average grant per company (€)	€1.500
Average Loan per company	€3.500
Interest Rate applied on loans	3%
Duration of the Loan (years)	7
Annual energy saving per company financed (KWh)	8.333 KWh
Annual monetary saving (per KWh) per company financed (€)	€0,103 / KWh
Success fee for ESCO (as a percentage of annual savings)	25%
Management fee for operator (% of total capital commitments)	2% for the first 5 years and 1,5% for the remainder time of the fund's operation)
Duration of the fund (years)	11
Interest rate generated on cash available annually	2%
Number of Companies financed per year (according to the budget allocation)	
Year 1	600
Year 2	900
Year 3	900
Year 4	600
Discount Factor for estimating the NPV of investments in energy efficiency	5%
VAT imposed on fund management services provided by the bank	19%
Income tax imposed on interest earned by cash management	15%

Financial analysis of benefits

The purpose of this analysis is to illustrate the benefits for small companies in financial terms. Three basic ratios are estimated:

- Net Present Value of the investment

- Internal Rate of Return
- Payback period

According to the data available, a cash flow is formulated based on the estimated outflows and inflows of the average beneficiary:

Table 23: Cash flow of Energy Efficiency Measures in a Commerce – Service Shop

Cash flow / company	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8
Investment cost	-5.000							
Annual energy savings	0	858	858	858	858	858	858	858
Compensation to ESCO (25%)		215	215	215	215	215	215	215
Grants	1.500							
Cash flow	-3.500	644	644	644	644	644	644	644
Aggregated Cash flow	-3.500	-2.856	-2.213	-1.569	-925	-281	363	1.006

Based on the cash flow the financial ratios are calculated as follows:

- NPV = €214 (for a period of 7 years after the completion of the investment)
- IRR = 6,7%
- Payback period≈ 6,4 years.

As long as the NPV is positive (based on the assumption that the discount factor of 5% is a sufficient measure) and the IRR exceeds risk free rate²⁷ and discount factor, the investment is efficient and it is worthwhile for a small company to undertake it.

As presented in the previous table the annual cash flow (based on energy savings) is sufficient to cover the annual debt service, since the annual payment for a 7 years loan with interest rate of 3% is **€561,77**, illustrating a debt service coverage ratio of 114,6%.

Therefore, JESSICA mechanism can be implemented in this kind of intervention ensuring at the same time, relatively safely, the repayment of the loan.

Financial Analysis of UDF Operations

The purpose of this analysis is to estimate the economics of the UDF's operations during its life period. Due to the basic assumption that the investment period lasts for 7 years

²⁷ 7 years yield of Greek state bonds is **3,85%**, source: Central Bank of Greece

and the budget is allocated within a period of 4 years, the total life time of the fund will last at least for 11 years, thereby allowing the repayment of the funds provided.

The allocation of resources is based on the initial budgetary plan formulated by the venture. The following table illustrates the outflows and inflows, based on the budget

Table 24: Financials of UDF

Fund commitments 10.500.000

Total Plan	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10	Year 11
Number of Companies implementing energy efficiency measures	600	900	900	600							
Loans disbursed	2.100.000	3.150.000	3.150.000	2.100.000							
Repayments	0	337.063	842.658	1.348.253	1.685.317	1.685.317	1.685.317	1.685.317	1.348.253	842.658	337.063
Management fees	2%	2%	2%	2%	1,5%	1,5%	1,5%	1,5%	1,5%	1,5%	1,5%
Management costs	249.900	249.900	249.900	249.900	187.425	187.425	187.425	187.425	187.425	187.425	187.425
End-of-year cash balance of UDF	8.150.100	5.087.263	2.530.022	1.528.375	3.026.267	4.524.159	6.022.050	7.519.942	8.680.770	9.336.004	9.485.642
Interest Rate income	158.526	112.518	64.747	34.496	38.714	64.179	89.643	115.107	137.706	153.143	159.984
Total End-of year Cash balance	8.308.626	5.199.781	2.594.769	1.562.871	3.064.981	4.588.337	6.111.693	7.635.049	8.818.476	9.489.146	9.645.626

Cash flow of the UDF consists of :

- Capital committed which covers the total amount of private contribution, that is €10,5 mil
- Minus loans disbursed according to the budget (600 companies x €3.500 / company for the first year, 900 companies x €3.500 / company for the second year etc)
- Plus repayments of the loans
- Minus management fees paid to the operator of the fund plus VAT 19%
- Interest rate gained by investing cash available at hand of the UDF, which is estimated by multiplying the assumed interest rate (2%) with the average cash at hand (cash available at the beginning of each year plus cash available at the end of the year divided by 2) minus income tax (15%)

The results of the calculations, lead to the conclusion that the total remainder amount at the end of eleventh year will be **€9,645 mil.**

6.4.2.8. Concluding Remarks

The previous analysis illustrated a clear example of how JESSICA instrument could be applied in a real case. Although the project has been planned in a different way, shifting technical and financial risk to the ESCO, the implementation of JESSICA requires small shops to bear the risk of paying back the loan, being the beneficiaries of support²⁸. Meanwhile, “Active Retailers” guarantees implicitly the attainment of energy savings through an agreement which compensates it via a success fee imposed on the annual realized energy savings.

The organizational scheme of the UDF implies that the Chamber of Corfu, as project initiator and project leader, is the founder and “owner” of the UDF until the paid in capital is returned back to the state.

It was assumed that a banking institution (under a management agreement with the fund) will undertake the operator’s role because banking institutions possess the appropriate know-how and infrastructure to evaluate and monitor loan products, taking also into consideration the volume of loans to be issued (3.000). In this case the banking institution should be assigned this role following a tendering procedure

²⁸ They are eligible for financing according to de minimis rule, since grants and loans provided by JESSICA do not exceed the threshold set by state aid regulations (€200.000)

according to the national law. In order to avoid any state-aid implications the role of the banking institution will be to act as an intermediary between the fund and beneficiaries.

The duration of the fund was estimated based on the initial plan of the project, taking into consideration that energy efficiency measures will take 4 years to complete and the agreement between small companies and ESCO will be for 7 years.

Financial calculations illustrate that energy efficiency measures provide beneficiaries with an acceptable return, and cash savings are adequate to ensure repayment of the loan (after deducting ESCO's compensation). The assumed interest rate on loans is appealing if compared to current interest rates (the average long term interest rate exceeds 5,5%).

Assuming the maximum management fee, allowed by the regulations, combined with the projected revenue stream from interest rates earned from cash available, the end balance of the UDF at the end of its life will be less than the initial capital by approximately €850k, which is explained by:

- The management fee charged by the operator of the fund. It should be noted that management fee, after the 4th year of UDF's operation is assumed to decline at 1,5%, because the role of the operator will be just to monitor the repayments of the loans and not to evaluate loans' applications.
- VAT (19%) imposed on the management fee, which is not refundable
- Income tax (15%) imposed on interest earned by cash management

The consultant ran again the financial model in order to test the level of interest rate should be applied on loan terms (considering the other variables constant) in order the UDF to get the initial capital back. The result of that simulation gave us an interest rate of **4,86%**, which is not very far from market interest rates.

Moreover, although present analysis does not include the cogeneration plant, this could be eligible for financing in the context of the proposed UDF under certain circumstances that do not fall within state-aid regulations. In this case, the proposed UDF would commit capital that exceeds the amount of €10,5 mil.

Finally an important issue should be discussed is the kind of guarantees provided for ensuring the repayments of the loans, according to the terms and conditions set. The possible solution would be that "Active Retailers" would directly guarantee on behalf of the beneficiaries debt service payments. This is a reasonable assumption to be

made, since according to the previous plan, “Active Retailers would bear the whole financial and technical risk by borrowing money in order to achieve sufficient energy savings, thereby paying back its debt and making a profit.

6.4.3 CASE STUDY 3: An Integrated RES system based on pump storage for producing electricity and hydrogen in Ios²⁹

6.4.3.1. Introduction

Almost all islands of Aegean Sea deal with two major problems, the first one being the fluctuations in electricity distribution and the second one being the lack of sufficient quantities of water. The provision of electricity through the traditional diesel generators of PPC is financially non viable and the quality of service is very low, due to lack of stability of the network and voltage fluctuations. It is estimated that PPC’s annual losses from the operation of diesel generators in the islands approaches €150 mil, while voltage interruptions give a hard time to consumers, especially during the touristic period (May to September).

The utilization of Renewable energy sources, such as wind and solar did not have the expected results due to the increasing problems of cooperation between wind farms and diesel generators, when demand is declining. More particularly, when demand is declining, wind turbines lessen the active voltage produced by diesel generators, resulting to low utilization of PPC’s venues.

Therefore, in periods of low demand the operation of wind turbines is abridged, thereby limiting their contribution to the energy balance of the islands. Thus, the installed wind farms in the islands suffer from power restrictions and abridgments of their operation.

²⁹ This case study is based on the study performed by ASE Synergy Consulting S.A and DIPE on behalf of Municipal Authority of Ios during the first phase of the proposed project

6.4.3.2. The Case of Ios

Ios is a small island of Cyclades complex. Its total population is 1.838 people and its main geographical characteristics are the following:

- Total surface: 107,8 sq km
- Shores' length: 87 km
- Distance from Piraeus port: 111 miles

Ios constitutes a significant tourists' destination, since it concentrates more than 6.000 tourists every year which spend approximately 32.000 nights (average staying 5 days approximately).

Ios' weather conditions are very favorable for the development of RES, especially wind farms.



Electricity is supplied through an undersea cable starting from Paros where the diesel generator of PPC is installed. This undersea cable supplies the islands of Naxos, Iraklia, Sikinos and Folegandros.

There are two wind turbines in Ios, of total capacity 330 Kw each. In addition, there is a water tank of total capacity 230.000 m³ as well as desalination venue of total capacity 30 m³ / h.

Illustration 8: The Water Tank of Ios



The installed capacity of wind farms in this electricity network combined with the expected capacity to be developed in the forthcoming years is estimated to reach 13,11 MW. According to estimations regarding today's demand structure and current capacity, the interruptions of the existing and forthcoming wind turbines, due to network's inefficiencies, will result to losses of wind energy which are estimated to 18 GWh annually.

6.4.3.1. The Solution to the Problem – Hybrid systems

The idea of Pumped Storage Systems, derived from the need to store amounts of energy, produced at a time when there was no demand for. The stored energy can be used some other time when a relevant need for energy supply comes up. A pumped storage system includes the following:

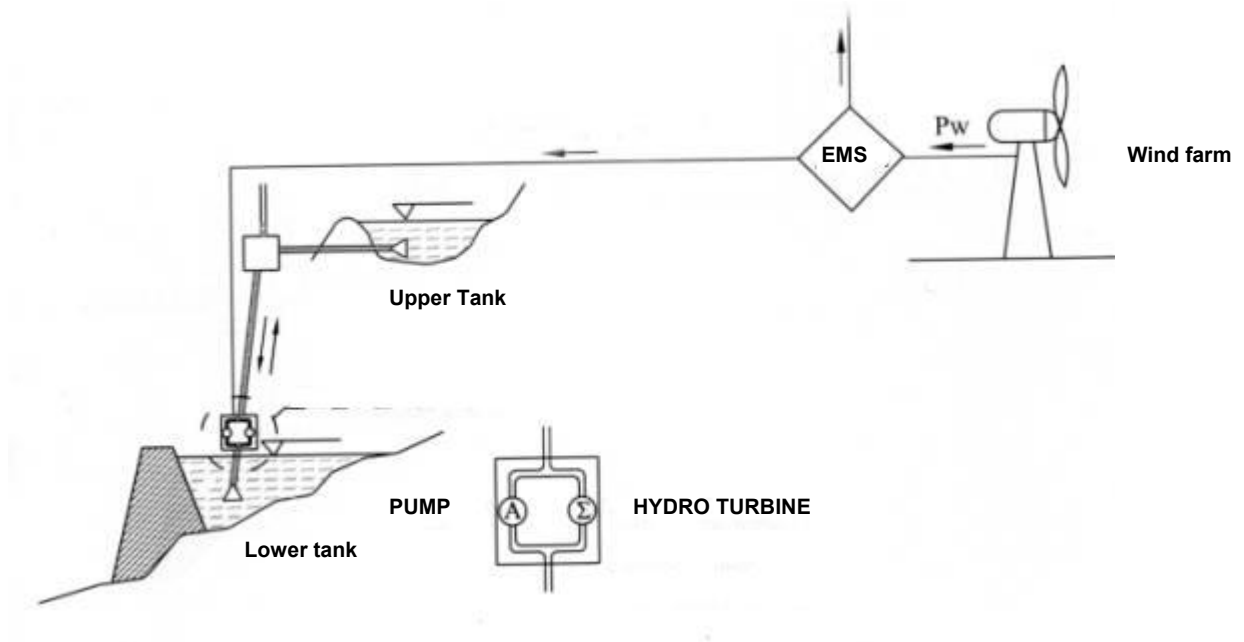
- A pump or a group of parallel connected pumps
- A hydro-turbine or a group of parallel connected hydro-turbines
- Two tanks of water with a certain hypsometric difference between them
- Hydraulic network for pumping water from the upper tank to the lower one
- Hydraulic network for water supply from the upper to the lower tank through the hydro-turbine, used for the electric energy production.

The operational philosophy of the pumped storage system is quite simple. The surplus of energy supplies the pumps, forcing the fluid (water) to rise through the upstream pipes from the lower to the upper tank, so that the surplus of energy is stored as dynamic energy. When the need for energy arises, water from the upper tank is let to flow through the downstream pipes to the lower tank, producing the required energy while running through the hydro-turbines. The dimensioning of the two pumps allows the use of a small percentage of the stored water volume. This percentage is sufficient for the energy transformation into dynamic form and vice versa, and hence eliminating the chance of either of the two tanks empties completely.

Because of the efficiency of pumps and hydro-turbines and friction that occurs inside the hydraulic network, only a part of the initially available stored amount of energy is fed back, through the hydro-turbines, which, reaches at best a 70% of the initial amount. That demonstrates the single use of pumped storage systems.

The pumped storage systems work exceptionally when combined with wind farms or thermal systems, but only to be used as a storage mean of the energy surplus. Schematically, a pumped storage system combined with wind farms is illustrated into the following graph:

Graph 5: Schematic presentation of pump storage system



The wind turbine represents the wind farm which produces the entire energy of the system. The wind farm supplies the system with electric power P_w . The energy management system (EMS) checks whether the supplied electric power exceeds the instant demand P_f . Different cases are analyzed below:

1. If $P_w > P_f$, then the wind farm entirely covers the instant energy demand and the surplus of energy is pumped by the hydro-electric system forcing the water to rise from the lower to the upper tank and is stored as dynamic energy. Assuming that the upper tank is full, either we reject the excess of the provided electric energy or take advantage of it in some other way (for example desalination) or we reduce the produced power from the wind farm.
2. If $P_w < P_f$, then the entire amount of energy yield from the wind farm is available to direct consumption, while extra energy is produced from the hydro-turbine to cover the current demand.

Extremely satisfactory results are achieved, deriving from the combination of pumped storage systems and thermal systems, concerning the saving of energy in cases of power surplus, due to technical minimums. It is proved that an important fuel saving as well as a short -term payback of initial investment assets is achieved with the use of a pumped storage system.

6.4.3.2. The proposed project

The proposed project regards the establishment of a hybrid station combining wind and water for producing electricity and supplying it to the distribution network. The hybrid station will supply electricity to the network, while it will also utilize spare capacity for supplying electricity to municipal venues (such as desalination and biological treatment). The main projects' constituents are:

- Construction of a new water tank at an appropriate altitude so that to permit the transfer of water between the current (lower) tank and the new (upper) tank
- Hydraulic network for pumping water from the upper tank to the lower one
- Hydraulic network for pumping water from the upper to the lower tank through the hydro-turbine, used for the electric energy production
- Pumps
- Installation of two hydro-turbines
- Installation of a wind farm of total capacity 16,2 MW
- Control System
- Installation of a new desalination unit which will supply water to the island and it will function as a supplementary unit for supplying the tanks with water when this is required.

The main benefits of the project are the following:

- Stabilization of the electricity network, thereby providing better service to the consumers
- Reduction of CO₂ emissions, since the station will contribute to the efficient utilization of diesel generator in Paros
- Boost of local economy, since the establishment of the station will transform the island to an energy center of Cyclades complex
- Enhancement of the autonomy of the island in water supplies
- It will significantly reduce the energy cost of local venues such as the desalination and the biological treatment.

The project's cost is allocated as follows:

Table 25: Project's Budget

Components of the System	Technical Specifications	Budget (€)
Construction of upper water tank	100.000 m ³	1.500.000
Hydraulic Networks	2.885 m	2.800.000
Wind turbines	16,2 MW	16.200.000
Hydro turbines	7,5 MW	2.800.000
Pumps	8,0 MW	2.000.000
Desalination Unit	2000 m ³ /d, 5Kwh / m ³	1.200.000
Control System	-	1.000.000
Surveys and Commissioning	-	1.800.000
Other Expenses	-	1.200.000
Total		30.500.000

The revenue stream of the project is based on the following:

- Electricity supply from the hydro turbines to the system during peak hours, estimated to 2.638 MW
- Electricity supply from the hydro turbines to the system during non-peak hours, estimated to 13.042 MWh
- Electricity supply from wind turbines to the system estimated to 29.707 MWh
- Monthly sales of available power capacity of hydro turbines, estimated at 7,5 MWh

The above revenue stream is based on the estimated dimensioning of the system combined with the pricing of RES as provided by the Law 3468/2006

6.4.3.3. Financial Metrics

According to the operational assumptions made during the planning phase, the project is feasible illustrating an IRR of 43%. Even in the worst case scenario IRR does not fall below 30%. Financial calculations do not include revenues from electricity supply to Municipal venues, neither revenue from hydrogen production.

The assumptions regarding the financing scheme of the project provide for the following:

- The project is eligible for grants in the context of Development Law 3299/04. According to the geographical and sectoral criteria of the law the relevant grant is 40% of total budget.
- Minimum contribution of the shareholders of the project (according to the requirements of the development law) will be 25% of total budget
- The remainder amount (35%) will be covered by a 10 years loan (assumed with an interest rate of 7%).

According to the above the following table illustrates the financing scheme of the project:

Table 26: Financing Scheme of the Project

Description	€
Share capital	7.625.000
Grants	12.200.000
Loan	10.675.000
Total	30.500.000

The forecasted P&L and cash flows of the project are illustrated into the following tables

Table 27: Project's P&L³⁰

		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	Revenue	3.997.809,92	3.997.809,92	3.997.809,92	4.074.786,22	4.153.302,04	4.233.388,18	4.315.076,05	4.398.397,67	4.483.385,72	4.570.073,54
Minus:	Cost of Sales	530.378,10	535.297,44	539.203,44	544.097,60	549.212,68	554.559,25	560.148,40	565.991,77	572.101,56	578.490,58
	Gross profit	3.467.431,82	3.462.512,48	3.458.606,48	3.530.688,62	3.604.089,36	3.678.828,93	3.754.927,65	3.832.405,90	3.911.284,16	3.991.582,96
Plus:	Other income	0	0	0	0	0	0	0	0	0	0
Minus:	Management Costs	3.467.431,82	3.462.512,48	3.458.606,48	3.530.688,62	3.604.089,36	3.678.828,93	3.754.927,65	3.832.405,90	3.911.284,16	3.991.582,96
	Marketing and distribution Costs	159.912,40	164.709,77	164.709,77	167.881,19	171.116,04	174.415,59	177.781,13	181.213,98	184.715,49	188.287,03
	EBITDA	3.307.519,42	3.297.802,71	3.293.896,71	3.362.807,43	3.432.973,32	3.504.413,34	3.577.146,52	3.651.191,92	3.726.568,67	3.803.295,93
Plus:	Interest earned	0	0	0	0	0	0	0	0	0	0
Minus:	Interest expenses	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31	969.385,31
	EBIT	2.338.134,11	2.328.417,40	2.324.511,40	2.393.422,12	2.463.588,01	2.535.028,03	2.607.761,21	2.681.806,61	2.757.183,36	2.833.910,62
Minus:	Depreciation / Amortization	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00	1.575.000,00
	Pre tax profit	763.134,11	753.417,40	749.511,40	818.422,12	888.588,01	960.028,03	1.032.761,21	1.106.806,61	1.182.183,36	1.258.910,62
Minus:	Income Tax (25%)	190.783,53	188.354,35	187.377,85	204.605,53	222.147,00	240.007,01	258.190,30	276.701,65	295.545,84	314.727,65
	Net profit	572.350,58	565.063,05	562.133,55	613.816,59	666.441,01	720.021,02	774.570,91	830.104,96	886.637,52	944.182,97

³⁰Real forecasts are developed in a time frame of 20 years. In the context of the current study we present the forecasts for the first ten years

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Table 28: Cash flows of the project

	Construction year 1	Construction year 2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Cash inflows												
Revenue from electricity supply to the network (peak hours)			232.249,52	232.249,52	232.249,52	236.894,51	241.632,40	246.465,05	251.394,35	256.422,24	261.550,68	266.781,69
Revenue from electricity supply to the network (non peak hours)			1.103.353,20	1.103.353,20	1.103.353,20	1.125.420,26	1.147.928,67	1.170.887,24	1.194.304,99	1.218.191,09	1.242.554,91	1.267.406,01
Revenue from wind energy			2.513.212,20	2.513.212,20	2.513.212,20	2.563.476,44	2.614.745,97	2.667.040,89	2.720.381,71	2.774.789,34	2.830.285,13	2.886.890,83
Revenue from capacity			148.995,00	148.995,00	148.995,00	148.995,00	148.995,00	148.995,00	148.995,00	148.995,00	148.995,00	148.995,00
Private Contribution	7.625.000,00	0										
Loans	7.625.000,00	3.050.000,00										
Grants		12.200.000,00										
Total Inflows	15.250.000,00	15.250.000,00	3.997.809,92	3.997.809,92	3.997.809,92	4.074.786,21	4.153.302,04	4.233.388,18	4.315.076,05	4.398.397,67	4.483.385,72	4.570.073,53
Cash outflows												
Construction cost	15.250.000,00	15.250.000,00										
Salaries			74.400,00	78.120,00	82.026,00	86.127,30	90.433,67	94.955,35	99.703,12	104.688,27	109.922,69	115.418,82
Other operating expenses			79.956,20	82.354,88	82.354,88	83.940,60	85.558,02	87.207,80	88.890,57	90.606,99	92.357,75	94.143,51
Debt payments			3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31	3.256.885,31
Municipal Taxes			79.956,20	82.354,88	82.354,88	83.940,60	85.558,02	87.207,80	88.890,57	90.606,99	92.357,75	94.143,51
Maintenance costs			416.000,00	416.000,00	416.000,00	416.000,00	416.000,00	416.000,00	416.000,00	416.000,00	416.000,00	416.000,00
Administration - Insurance costs			39.978,10	41.177,44	41.177,44	41.970,30	42.779,01	43.603,90	44.445,28	45.303,50	46.178,87	47.071,76
Total Outflows	15.250.000,00	15.250.000,00	3.947.175,81	3.956.892,51	3.960.798,51	3.968.864,11	3.977.214,03	3.985.860,16	3.994.814,85	4.004.091,06	4.013.702,37	4.023.662,91
Net Cash flows	0	0	50.634,11	40.917,41	37.011,41	105.922,10	176.088,01	247.528,02	320.261,20	394.306,61	469.683,35	546.410,62

Financial metrics, to the extent that dimensioning and operating assumptions are correct, illustrate clearly that this is a rather profitable investment and there is sufficient cash flow to pay back debt service or dividends in a case of equity participation. Therefore, in terms of ensuring the payback of a potential JESSICA investment, the project clearly illustrates its eligibility.

6.4.3.4. The organizational scheme of the project

The results of the planning phase of the project concluded that the project should be developed in the context of a private public partnership agreement where Municipal Authority will transfer the rights of using the land and other Municipal venues to a private corporation which will undertake the risks for constructing the appropriate venues and operating the whole system.

The advisors concluded that the relative Law for PPPs (L.3389/2005) is not the appropriate instrument to proceed to such a partnership, since Development Law 3299/04 strictly forbids the provision of any grants to projects submitted to L.3389/2005. Thus, the project could not be eligible for grants up to 40% of total investment costs.

Therefore, the final proposal is the establishment of a PPP based on a contracting procedure, according to which:

- Municipal authority of IOS undertakes the responsibility to transfer the rights of using the appropriate land and venues for a certain period of time, in order to facilitate the private investor to implement the project.
- Private investors undertake the business risk to acquire the required licenses, build the system and operate it, against certain fees and / or other returns provided to Municipal Authority. After a certain period of time private investors will be obliged to transfer the investment to Municipal Authority.

6.4.3.5. Concluding Remarks

The proposed project deals with two major problems faced by the Island of Ios. The first one is power supply and the second is water supply. In essence the proposed project contributes significantly to the overall development of the area fulfilling the three aspects of sustainable development (environment, economic, social).

Considering also the intense tourism activity during summer, as well as the isolation characteristics of the island, the proposed project contributes significantly to the improvement of quality of life.

Therefore, this is a project eligible for financing by JESSICA, in the context of two basic scenarios:

- A regional UDF aiming to the implementation of various urban development interventions in Cyclades complex, including energy efficiency
- A thematic UDF of regional or national range aiming to finance PPP projects related to energy efficiency and utilization of Renewable Energy Sources.

Regardless of the precise format of the UDF (general or thematic, local / regional / national) forecasted P&L and cash flow illustrate the financial capability to pay back UDF's contribution to the project.

There are also several risks to be taken into consideration, when exploring the potential of such projects, the most important of which are:

- **The maturity of the project.** The current case study describes a project which is in the planning phase. That means, that problems in assuring the appropriate licenses (environmental terms, installation permit, operation permit) have not been taken into consideration. The real case, however, is that investments in RES deal with major bureaucratic problems due to inefficient legislative framework. A simple example to justify that point, is that applications for RES electricity production licenses submitted in June 2007 were approved in July 2009, that is more than 2 years. A new legislative framework is expected. According to central administration's announcements this legislative framework will reduce the time required to get licenses to 10 months (from 3 to 5 years)
- **Local communities' response.** For various reasons, local communities may respond negatively to this kind of interventions. It might take time to assure local communities' acceptance and understanding of the benefits that these project carry on for their homeland
- **Technical risks.** These risks are related to the achievement of the planned specifications of the venues, that is capacity and operational capability. Technical risks are always apparent in any kind of project. However, in Renewables, risks are higher since it is very critical to design appropriately the venues, according to weather conditions, available technologies, operating requirements etc. Failures during the design phase may have a major impact on the financial viability of the project.

- **Financial risks** are related to liquidity of the investors, the level of interest rates the assurance of grants etc.

The first risk category (maturity) is the most critical when financing this kind of projects. Therefore, every effort in establishing a UDF for financing PPPs in the energy sector should first take into consideration the maturity of candidate projects, assess the current stage of implementation and assure that the probabilities of failures are very low.

6.5 Categorization and Evaluation of Energy Efficiency Projects

Following the analysis of the environment and the case studies performed, we conclude to four basic categories of energy efficiency projects:

1. Interventions in Municipal Venues (in the context of EXOIKONOMO initiative)
2. Energy conservation interventions in households' buildings
3. Establishment of thermal and electrical power production units at local level, through the utilization of Renewable Energy Sources. PPPs constitute a significant instrument to proceed to such investments
4. Establishment of electrical power production units through the utilization of Renewable Energy Sources by private enterprises in the context of Development Law.

By applying the general evaluation criteria regarding the applicability of JESSICA (see also paragraph 6.3) in these projects' categories, the following conclusions arise:

- As far as the first category is concerned, it is the most mature, taking into consideration that Municipal Authorities have already submitted the integrated energy efficiency action plans to the Managing Authorities. The demand for financing is relatively fixed. The integrated character of the energy efficiency action plans contributes significantly to integrated urban development.
- As far as the energy conservation interventions in households' buildings are concerned, the demand for the implementation of such projects is very clear, since the vast majority of houses have not been built according to appropriate thermal insulation specifications. Social housing is an eligible intervention in the context of JESSICA. In financial terms, however, demand cannot be defined precisely. A restricting factor seems to be the lack of an efficient energy services market due to delays in incorporating the directive EC 2006/32 into the Greek legislative framework.

- The establishment of energy production units through the utilization of RES and PPPs is also a very attractive field for JESSICA type financing schemes, since, these kinds of projects, if developed at local level, may significantly contribute to integrated urban development. According to the mapping process we identify a significant demand. However, delays in licensing production units may increase significantly financial risks.
- The establishment of electrical power production units through the utilization of RES constitute a category with significant demand and relatively mature, since many projects have been approved by the Ministry of Economy, Competitiveness & Shipping in the context of Development Law. However, these projects constitute ad-hoc initiatives undertaken by private enterprises and are not incorporated in an integrated urban development plan.

The following table summarizes the findings of the evaluation process

Table 29: Evaluation of Eligible Project Categories

Projects' Categories	EVALUATION CRITERIA			
	Contribution to Integrated Urban Development	Need / Demand	Projects' Maturity	Institutional Framework
Energy efficiency Interventions in Municipal venues	Integrated energy efficiency action plans	Budget €100 mil, funds' supply €70 mil	Integrated action plans have been submitted to MAs for evaluation	Delays in incorporating the directive EC 2006/32 into the Greek legislative framework
Housing interventions	Eligible intervention in the context of JESSICA framework	The vast majority of houses (built before 1980) has not been built according to appropriate thermal insulation specifications. Households' energy consumption comprises a large share of total energy consumption. Per capita energy consumption is constantly increased, while in EU the relevant index is decreased..	Redesigned	Delays in incorporating the directive EC 2006/32 into the Greek legislative framework

Projects' Categories	EVALUATION CRITERIA			
	Contribution to Integrated Urban Development	Need / Demand	Projects' Maturity	Institutional Framework
Utilization of RES for the establishment of energy generation units through PPPs and investment in district heating venues at local level.	They contribute to integrated urban development under certain circumstances	We identified 6 projects with total budget €300 mil. There is also a call for proposals running in the context of the OP "Environment & Sustainable Development" whose remainder amount (public expenditure) is €30 mil.	Two projects (district heating) have been approved for financing by the OP "Environment & Sustainable Development". The remainder PPP projects are still in the planning phase.	Delays in licensing RES investments
RES investments by private investors in the context of Development Law 3299/04	Ad-hoc initiatives of private investors. They are not related to integrated urban development.	≈€450 mil	Under implementation	Delays in licensing RES investments

6.6 Estimation of the Funding Gap

As discussed in paragraphs 6.3.2 total demand for energy efficiency projects was estimated to €629,5 mil. A large proportion of this amount regards energy production from renewable energy sources, which only under certain circumstances could be eligible for financing under the JESSICA framework. The main condition for these projects to be eligible is their incorporation into integrated urban development plans which will, inter alia, include also complementary energy efficiency interventions at local level. This is, however, not achievable, since all these projects are launched by private promoters on an ad-hoc basis, in the context of their entrepreneurial activities and not in the context of integrated urban development plans. Therefore, this part of demand is not considered eligible and will not be taken into consideration.

Another part of demand regards the development of district heating systems, mainly in West Macedonia (Florina and Ptolemaida). These interventions could be considered as urban development projects that contribute significantly in the context of energy saving and environmental protection. The demand for financing, according to the proposals submitted until now is **€22,28 mil.**

We also identified demand for the establishment of power generation facilities by using RES, through Private Public Partnerships. This might also be an area of interest in the context of JESSICA. According to our view PPPs could be eligible for JESSICA:

- Either in the context of an integrated urban regeneration plan which includes, inter alia, PPP projects for utilizing RES
- Or in the context of a thematic fund for developing RES related PPP projects on regional (e.g Cyclades) or national level.

The total financing gap for these interventions was estimated to **€93,17 mil.** However, these projects are not in such a maturity stage of their life cycle so that to establish a dedicated structure for financing them (see also case study 3). Legislative, bureaucratic, as well as local issues impose a rather rigorous preparation at central and regional level so that to ensure that a critical mass of relatively mature projects will be gathered.

The initiative “EXOIKONOMO”, has created a total demand of €161,9 mil, of which €70 mil will be provided by the OP “Competitiveness” and Regional Operational Programs of Transitional Support Regions. That means that we have a financing gap of total value **€91,9 mil.** However, this amount includes projects that will not be eligible for grants, since, the total submitted budgets exceed the overall budget of the initiative. The evaluation process will be based on a competitive rationale and the

best graded proposals, till the expense of the budget, will be eligible for grants. Thus, some of the proposals due to lower grading will not be eligible in this phase of EXOIKONOMO. Therefore, the above amount should be split into two parts:

- The first part concerns the private contribution of Municipal Authorities that will be eligible for grants and amounts to **€30 mil.**
- The second part concerns the budget of integrated energy efficiency action plans of municipalities that will not be eligible for grants and amounts to **€61,9 mil.**

There is no assurance, however, that not eligible municipal authorities will proceed to a JESSICA type financing for their energy efficiency projects. Bearing in mind the case of Rhodes, we should be very cautious regarding the reciprocal character of these projects and their impact on Return on Investment and debt service coverage. In addition, lack of liquidity and the need to prioritize among a mixture of infrastructure projects at local level, will definitely influence the decision to proceed or not to proceed to the implementation of these particular projects.

Hence, in case that the new administration decides to proceed to a competitive evaluation procedure, then we can relatively safely determine that total demand for financing in the context of EXOIKONOMO is **€30 mil.**

As far as the housing initiative is concerned, we do not have any particular information, regarding the type of incentives and the public expenditure available. Therefore, it is not possible to estimate the funding gap, since there are no particular information regarding supply of funds and policy priorities regarding funding. The only available information regarding this particular case is the objective set by the National Council of Energy Strategy to implement energy efficiency measures in 250.000 dwellings, with a total budget of approximately €2,95 bil. This amount exceeds by far ERDF's contribution to energy efficiency interventions in the context of NSRF (≈€494,4 mil).

Taking into consideration the directions provided by the explanatory memorandum 2008/0245 (COD) for amending Regulation (EC) No 1080/2006, mentioning that *"it is also essential, in the framework of interventions under the cohesion policy, to concentrate the efforts where the public intervention is needed, in the case at issue **to the benefit of the low-income households** As there is no EU definition of the latter, Member States have to apply a national definition based on national provisions in force"*, any kind of housing initiative should be implemented based on socio-economic criteria serving the needs of more vulnerable households. These criteria, however, have not been set yet by the Greek state.

7 Recommendations

7.1 Compilation of Alternative Scenarios

The projects' characteristics as derived by the mapping process, combined with the results of the evaluation process lead us to the conclusion that we can have three types of UDFs:

1. A UDF whose purpose will be to finance energy efficiency action plans of Municipal Authorities as a complementary financial instrument combined with the provision of grants in the context of EXOIKONOMO.
2. Another UDF whose purpose will be to finance housing interventions aiming to energy conservation
3. Another UDF whose purpose will be to finance PPPs or other projects utilizing RES and / or aiming to provision of low cost and environmentally friendly energy to the consumers (such as district heating).

The objectives that should be achieved in the context of establishing energy efficiency UDFs are:

- Contribution to the reduction of energy consumption and CO₂ emissions.
- Leveraging private resources, so that to magnify the impact of the interventions undertaken.
- Provision of attractive financial products easily accessible to local authorities, households and private enterprises, thereby leveraging local and regional economies.

The technical details and the operational characteristics of these UDFs are provided into the following paragraphs.

Recommendations regarding the technical details of UDFs are based on the reasonable assumption that a JESSICA Holding Fund will be established which will be operated by European Investment Bank. The fundamentals that justify this assumption are the following:

- EIB is, at European level, the entity bearing the whole responsibility for providing technical assistance to member states regarding JESSICA instrument. EIB established a specialized mechanism (JESSICA task force) for developing and supporting member states

- EIB possesses significant experience and expertise in project financing and fund management
- Setting up of UDFs under a holding fund umbrella where EIB is the operator of the holding fund, ensures the credibility of operations and the speed of action, since EIB possesses the appropriate expertise and experience to run operations and utilize its aggregated experience attained by other member states' operations.
- Regulation 1083/2006 provides that *“When such operations are organized through holding funds, that is, funds set up to invest in several venture capital funds, guarantee funds, loan funds and urban development funds, the Member State or the managing authority shall implement them through one or more of the following forms:*
 - *the award of a public contract in accordance with applicable public procurement law;*
 - *when the agreement is not a public service contract within the meaning of applicable public procurement law, the award of a grant, defined for this purpose as a direct financial contribution by way of donation to a financial institution without a call for proposals, if this is in accordance with a national law compatible with the Treaty*
 - *the award of a contract directly to the EIB or the EIF”*

Therefore, since Consignment and Depository Trust is the only entity entitled by national law to run Holding Funds or UDFs and since CDT does not possess the appropriate expertise to develop such operations, EIB is the most reliable organization for ensuring the efficient launch of UDFs.

7.1.1 Scenario 1: Establishment of a Municipal Energy Efficiency Fund

The proposed fund will provide long-term loans to Municipal Authorities, to cover own contribution to the initiative EXOIKONOMO. Total capital committed for loans will be €30 mil while an additional amount should be provided in order to cover management fees.

The main product to be provided will be a long term loan, initially estimated to last for 10 years with constant quarterly payments. The proposed interest rate of the loan should not exceed 2% thereby being attractive to Municipal Authorities and at the same time covering part of the management costs of the fund. A major issue to deal with in this case is the assurance that loan payments will be paid back ordinarily.

The case study of Rhodes' Municipality, shows that not all interventions will be compensating. Thus we cannot be sure that energy savings will be plenty enough to cover debt service. Therefore, since there is not an institutionalized energy services

market (ESCOs could guarantee energy savings), the fund should follow a collaterals' approach based on delegating part of the central sovereign resources³¹ attributed to each municipality. This is a common practice followed by financial institutions, when they borrow municipal authorities.

Committed resources should be deposited proportionally by the Regional Operational Programs and the OP "Competitiveness & Entrepreneurship, based on the allocation of resources in the context of EXOIKONOMO initiative. For instance, if the evaluation of proposals concludes to approvals of total budget €24.168.421,05 (that is 34,5% of total public expenditure) attributed to Municipalities of Attica, then €10.350.000 (34,5% x 30.000.000) will be committed by ROP of Attica in order to participate into the municipal energy efficiency fund.

Therefore, a necessary requirement for establishing a Municipal Energy Efficiency Fund is to complete the evaluation of proposals and to allocate the budget to Municipal Authorities.

Then, according to National Law, a joint ministerial decision should be issued (Minister of Economy, Competitiveness & Shipping and Minister of Environment, Energy & Climatic Change) for the establishment of the fund prescribing the terms and conditions and any other detail regarding OPs contributions to the fund.

Then, holding fund's operator will proceed to a call for proposals requesting by financial institutions to submit their business plans regarding the operation of Municipal Energy Efficiency Fund. The content of this call for proposals should include the products to be delivered, the interest rate charged, the duration of the fund, the proposed organizational structure, as well as the appropriate know-how to be possessed by the candidate institutions. The technical part of the call for proposals should be based on technical criteria that prove the capability of the candidate institutions to operate the UDF (pass or no pass criteria) and financial criteria which are related to the management fee offered by financial institutions.

Another way to proceed faster is to assign directly the operation of the fund to Consignment and Depository Trust, since, according to National Law, CDT is assigned the rope to operate UDFs or Holding Funds (see also paragraph 5.1). CDT is a state financial institution which provides loans to local authorities, mortgages to public employees and depository services to non-profit agencies, citizens and local authorities. CDT is also an intermediary entity between central administration and local authorities for providing state aid to local authorities. According to the financial statements of CDT, in 2008 the balance of loans provided to local authorities was

³¹ Central sovereign resources are essentially the annual state aid provided by central administration to local authorities

€1,352 bil. In 2008 CDT provided 299 loans to local authorities of total value €219,750 mil and its total assets were €6,3 bil.

The option of utilizing CDT is based on the fact that CDT is a specialized financial institution which provides loans to Municipalities. Therefore, taking into consideration, that the national legislative framework provides for CDT to operate UDFs or Holding Funds this is the fastest way to proceed to the establishment of such a UDF, since the target beneficiaries will be Municipal Authorities.

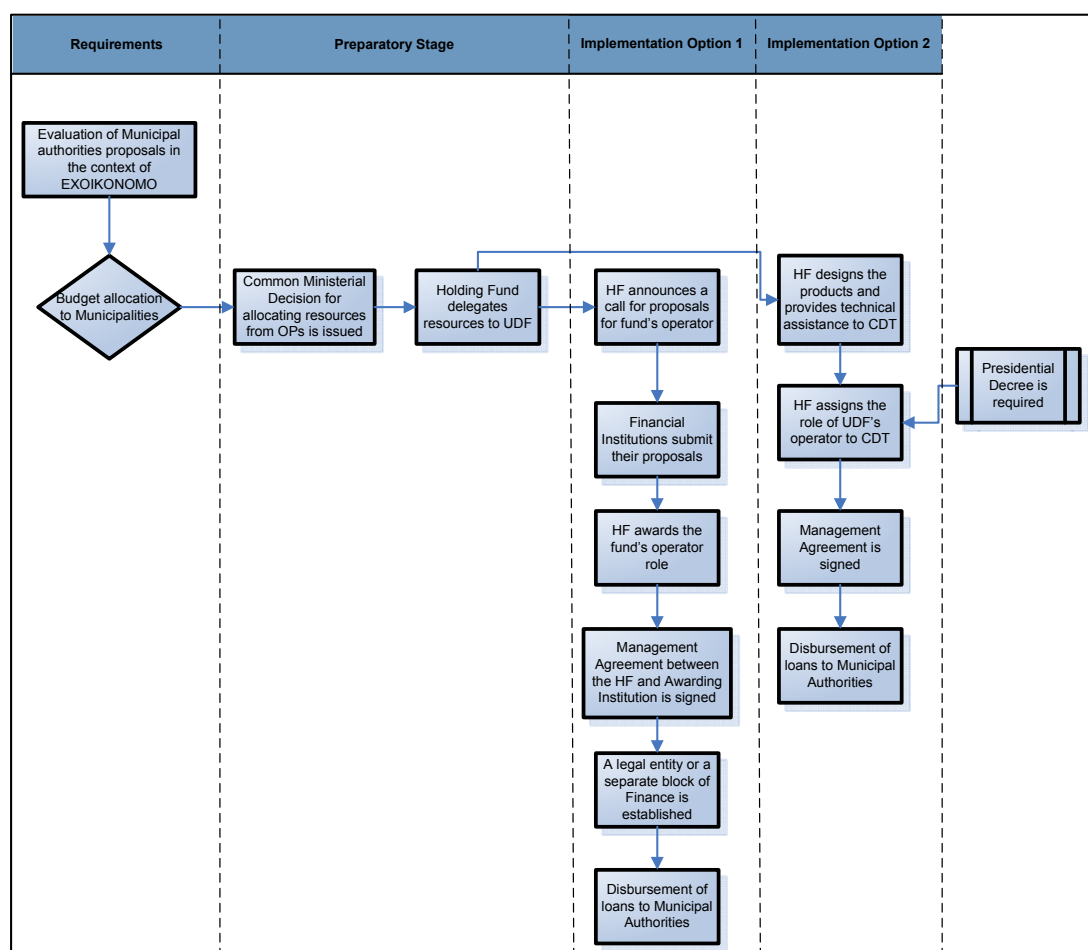
However, CDT does not possess the appropriate know – how to design financial products, therefore the EIB's technical assistance is required. Essentially, EIB will put together a management agreement with CDT which will provide for:

- Fund duration
- Financial products to be provided
- The maximum amount of loans to be provided to Municipalities
- The terms of the loans (interest rates, duration, payments etc)
- Collaterals
- Winding – up provisions

For this solution to be feasible, according to national law, a presidential decree is required which will define the appropriate organizational and other requirements in order to establish a legal entity or a separate block of finance, as required by regulations.

The following process flowchart illustrates the required steps in order to establish the Municipal Energy Efficiency UDF

Graph 6: Implementation Options of Municipal Energy Efficiency UDF



It seems that the utilization of CDT is the most efficiency way to proceed to the establishment of the Energy efficiency UDF, since fewer steps are required. However, the prerequisite to compose a presidential decree might cause delays in completing the whole process of establishing the fund.

7.1.2 Scenario 2: Establishment of a Housing Energy Efficiency Fund

The proposed fund will provide long term loans to households for implementing energy efficiency interventions into their houses, such as:

- Thermal insulation
- Installation of natural gas boilers
- Installation of solar systems for water heating
- Replacement of frames and installation of double glazing windows.

According to 2008/0245 (COD) “proposal for amending Regulation (EC) No 1080/2006 on the European Regional Development Fund as regards the eligibility of

energy efficiency and renewable energy investments in housing” it is stressed that “It is also essential, in the framework of interventions under the cohesion policy, to concentrate the efforts where the public intervention is needed, in the case at issue to the benefit of the low-income households”.

It is up to central administration to finalize the criteria to be used, in order to identify specific areas and target groups which should be addressed. However, it should be taken into consideration that according to compliance requirements, the fund will address households that do not necessarily have significant financial capabilities. Therefore, the possibility of combining JESSICA with an initiative which provides grants to households for energy efficiency interventions seems to be the safest option.

As mentioned above, the products to be provided should be micro-loans not exceeding €10.000 to €15.000, since the fund will focus on relatively low income households probably as a complementary financial assistance to grants. The average estimated amount (€11.800) for such interventions as assessed by the National Council for Energy Strategy (see also paragraph 2.1.3) is within the above range.

Interest rates should be at competitive levels exceeding the reference rate plus 100-200 basis points so that not to have any state aid implications in case that these loans will be provided as a complementary financial assistance to grants. The duration of the loans is estimated to 7-10 years with monthly payments. Assuming an interest rate of 3,5% which exceeds by far the current reference rate (1,45% for Greece), the monthly payment for a €15.000 loan of 10 years duration is €148,33 (€98,89 for a loan of €10.000), an amount which is relatively affordable for low to medium income households.

The proposed mechanism, through which the housing energy efficiency fund will be established, consists of the following steps:

- Designation of resources that will be delegated by Operational Programs to the fund. The issuance of a ministerial decision will be required.
- The holding fund commits the resources above for setting up the fund
- The holding fund operator prepares a public tender addressing banking institutions to submit their proposals for operating the fund. There are two options :
 - Public tender aims to leverage banking institutions’ resources by establishing a co-financing scheme where NSRF and private resources will be invested into micro loans. Banking institutions will be evaluated according to their network as well as their organizational

and staff capabilities to administer a particular load of loans, as indicated by the target group of the fund and the available committed capital. Additionally banking institutions will be evaluated based on a business plan which will include:

- Products to be provided
 - Amount of equity to be invested into the fund
 - Interest rates
 - Management fee
 - Evaluation criteria
 - Collaterals to back up debt service
 - Marketing plan (awareness programs, publicity etc)
- The fund will be 100% financed by public contributions. Therefore, public tender concerns only the operation of the fund. Banking institutions will play the role of intermediary for dispersing and monitoring the loans according to specifications and products designed by the HF operator. Banking institutions will be evaluated according to their network as well as their organizational and staff capabilities to administer a particular load of loans, as indicated by the target group of the fund and the available committed capital. If banks pass the above criteria, then management fee will become the crucial variable for assignment.
- A funding agreement between the holding fund and the awarding banking institution is signed
 - Finalization, fine-tuning of products to be provided
 - Establishment of legal entity or a separate block of financing within the selected banking institution
 - Disbursements of loans to households

It should be noted that banking institutions were selected, because they constitute the most appropriate mechanism:

- to provide sufficient population coverage
- they possess the required know-how to design and administer loan products
- they possess the appropriate organizational and information systems to respond relatively quickly to the requirements of such a structure
- They acquired significant experience and know-how in ERDF regulations and procedures since they played the role of Intermediate Management Bodies regarding SMEs initiatives.

- They also possess the appropriate engineering staff to perform the appropriate technical audits regarding the quality assurance of each project

A major also question is what are the benefits to be offered to banking institutions in case they become co-investors in such a scheme. According to the consultant's view, the main benefits are:

- They leverage a new market which, under other circumstances, would not be existed, thereby increasing their turnover
- the fact that UDF does not necessarily require significant returns gives them the opportunity to charge a market rate for their funds, thereby providing to the end beneficiary a weighted interest rate, which is at lower levels.
- Management fees earned by running the fund

There are two more issues to be discussed as far as the housing energy efficiency fund is concerned:

- The first issue is related to the basic requirements that households should comply with in order to be eligible for getting financing from the fund. There are two basic categories of prerequisites to comply with:
 - The first category regards the compliance with the criteria set by Managing Authorities e.g:
 - **Age of the building.** Is documented by submitting the construction permit of the building which will verify whether a building is constructed before 1980.
 - **Income.** Is documented by submitting tax documents and / or employer certifications regarding the income of the household's members
 - **Area where the building is located.** Is verified by the property's documents and the relevant bills (electricity, water, etc)
 - The second category regards the verification that borrowers will expense the money for energy efficiency interventions in their houses. To justify that, the following steps should be undertaken by apartments' owners:
 - The general assembly of the multi-family building decides to proceed to energy efficiency interventions
 - The administrator of the multi-family building requests offers by contractors

- The assembly evaluates the offers and selects the most appropriate
 - A contract between the contractor and apartments' owners is signed. The contract must describe analytically the works to be implemented in the building and the budget allocated to each owner. Contracts should carry the authentication stamp of the authorized tax office.
 - Apartment owners attach the contract (and other documents required) to the application form which will be designed by the operator of the fund.
- The second issue regards the assurance that debt payments will be served. Since energy services market does not exist in Greece, and considering also that the beneficiaries of the fund are low income households, the fund should provide for guarantees based on assets of the borrowers. It is important to note, that applying a public tendering procedure to select commercial banks shall not automatically mean that no state aid is present. Special attention should be given to clauses of the financing agreement concluded with the selected banks, in particular with regard to sharing of investment risk between the State and commercial banks. If, on the basis of the agreement, the State undertakes all or most of the investment risk, this will provide economic advantage to the commercial bank which it would not have received under normal market conditions and will constitute inadmissible state aid, and, as a rule, should be a subject to notification.

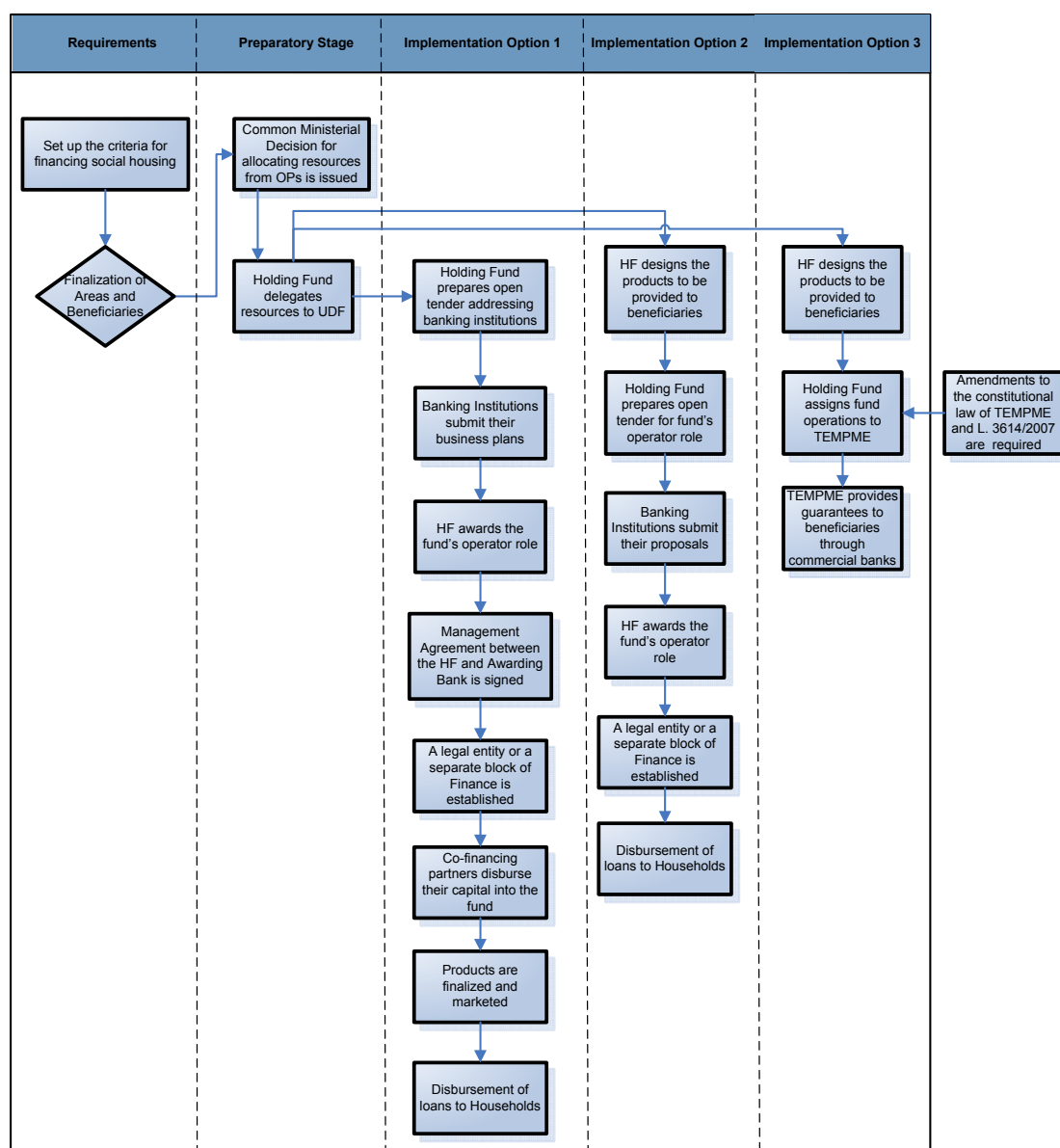
A potential solution to collaterals' issue is, instead of setting up a fund which will provide loans, to set up a **guarantee fund**, which will guarantee for 80% of the loans provided and charge a fee based on safe harbor premium. According to Commission Notice on the application of Articles 87 and 88 of the EC Treaty to State aid in the form of guarantees (2008/C 155/02) this premium might be 3,8% (when there is lack of credit history). In this case assuring 80% of the capital provided, banking institutions will be more willing to reduce interest rates and make loans more attractive to beneficiaries. However, by charging the safe harbor premium the loans will still be expensive. If this option is implemented, then the most appropriate structure to be used is the Credit Guarantee Fund for small size enterprises (TEMPME), which performs this work for SMEs (see also paragraph 5.3.3). In this case the constitutional law of TEMPME should be amended and the L. 3614/2007 should also incorporate TEMPME as a competent organization for running UDFs so that to directly be assigned by the HF operator.

The steps in this case are the following:

- The Holding fund Operator in association with commercial banks and TEMPME finalize the loan products to be provided for the purpose of financing housing energy efficiency interventions
- The HF assigns TEMPME the operation of the fund
- TEMPME provides guarantees to beneficiaries. Applications for guarantees are submitted to banks by beneficiaries. If the commercial bank considers that the candidate beneficiary is eligible according to the criteria set it forwards the application to TEMPME which evaluates the application and approves the provision of guarantee.

The following process flowchart illustrates the required steps in order to establish the Housing Energy Efficiency Fund

Graph 7: Implementation Options of Housing Energy Efficiency UDF



According to the consultant's view the first option is more desirable, since it leverages private resources, enlarges the financing capability of the fund and it exploits the expertise of specialized institutions in designing and marketing financial products.

7.1.3 Scenario 3: Establishment of RES fund

The purpose of this fund will be to finance energy generation projects which utilize renewable energy sources, district heating systems and any other environmentally friendly technology which substantiates contribution to local development. Projects' owners will be PPPs and / or Municipal enterprises (water and drainage enterprises, district heating enterprises etc). This fund will provide long term loans and / or equity to the above beneficiaries, in order to finance particular projects related to the above sectors.

The fund will be established following a call for proposals procedure undertaken by the holding fund operator. This call for proposals will address local authorities, private investors and certified financial institutions which are willing to establish funds for financing such projects. Participants to this call for proposals will submit their business plans which must include:

- Available resources to be provided to the fund
- Organizational skills and competences
- Pipeline of projects
- Description of financial products to be provided
- Interest rates
- Collaterals
- Fund duration
- Fund Management approach – methodology
- Proposed organizational structure of the fund. Decision making approach
- Management fee offered
- Winding up provisions

According to the results of the evaluation the awarding candidate is called to establish a legal entity which will be governed by an agreement between the co-financing partners and the Holding Fund, or to establish a separate block of finance within the financial institution. In this case the establishment of an independent legal entity seems to be the more attractive solution because it assures transparency in decision making and is less complex, since there might be more than two investors in the fund. Co-financing partners, including the holding fund, commit capital

proportionally and get into a management agreement with the financial institution whose responsibility will be to evaluate, invest and monitor its portfolio of investments during the life span of the fund.

It should be noted, that the participation of local authorities and their agencies in UDFs is regulated by law 3614/2007. The law provides that the terms and conditions under which local authorities and their agencies may participate in UDFs will be defined by a ministerial decision (not issued). In addition, the article 252 (Municipal Enterprises) of Law 3463/2006³² provides that Municipal Authorities have the right to establish and / or participate in various corporations through their subsidiary enterprises. However, they have to possess the majority of share capital. This is a major limitation imposed by the current legislative framework.

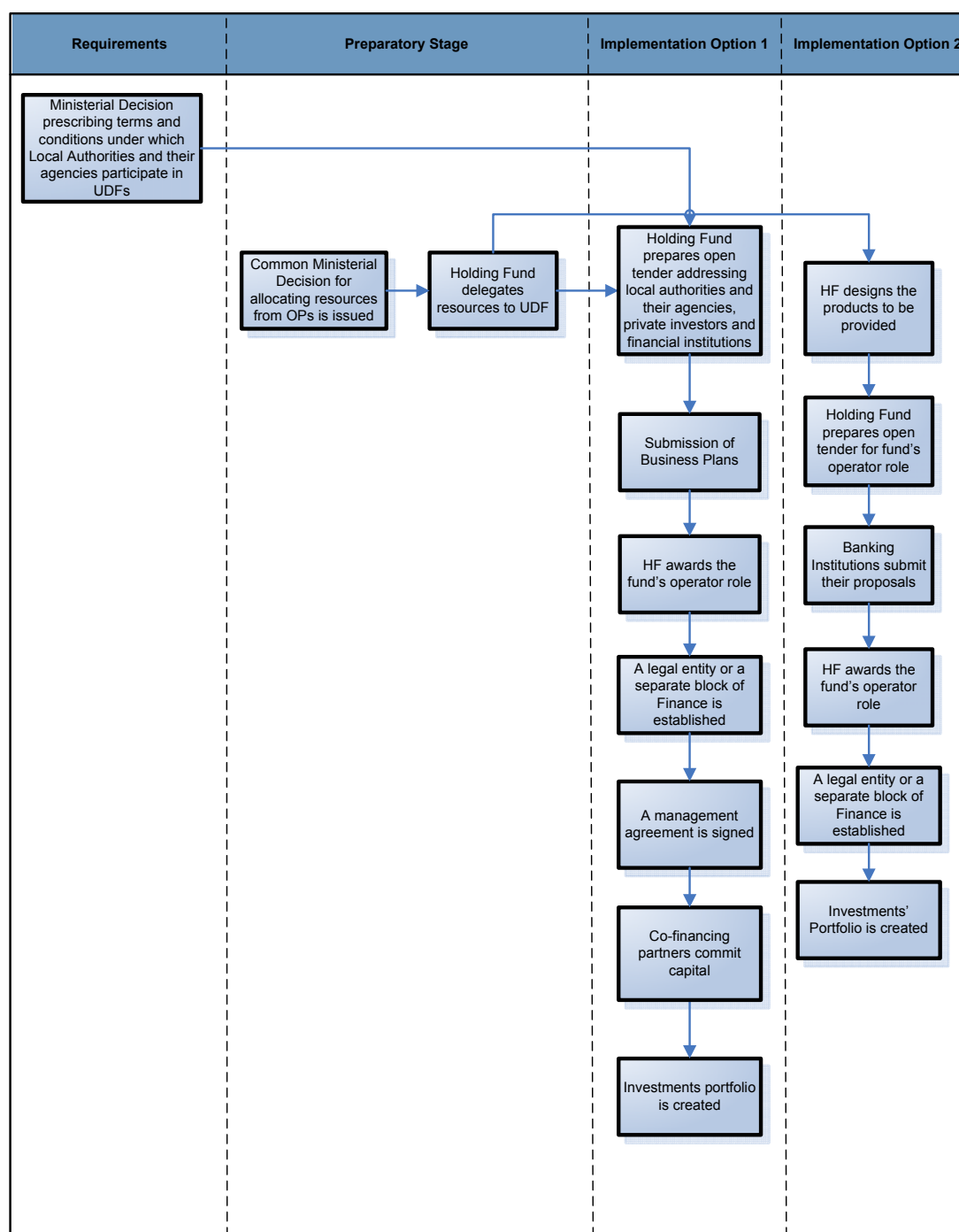
The proposed framework, as described above, aims to leverage resources from private investors and enhance the co-operation between local authorities and investors so that to enlarge the potential impact of the fund on energy efficiency.

Another option, is to establish a UDF 100% financed by public contributions (ERDF and national resources). In this case, the holding fund operator will proceed to a similar call for proposals, however, candidates will not contribute resources into the fund. They will have to substantiate their technical and operational capabilities to locate, evaluate and invest in related projects, according to the directions provided by the Holding Fund, and to monitor the performance of the investments' portfolio until the closing of the fund.

The following process flow-chart illustrates the required steps in order to establish the RES Energy Efficiency Fund

³² Law 3463/2006 provides for the responsibilities and obligations of Municipal Authorities.

Graph 8: Implementation Options of RES UDF



7.2 Scenario Evaluation

In the previous paragraphs alternative forms of UDFs were developed, according to the projects' categories identified. Different implementation options were also developed according to the current regulatory environment and the extent to which private resources could be leveraged. The purpose of this paragraph is to prioritize the scenarios developed and to highlight the preferred implementation options.

Although it is obvious that the development of each alternative scenario does not exclude the development of the other two, it is clear the resources and efforts should be promptly focused in order to proceed quickly and effectively to the initiation of JESSICA.

As far as the priorities should be set among the alternative scenarios the following hierarchy is recommended:

1. As mentioned in many parts of the current study the utilization of JESSICA as complementary instrument to grants in the context of EXOIKONOMO is the most mature field of intervention. Energy saving in public venues is a major priority not only in Greece, but also in the EU. Municipal Authorities are expecting to have significant financial difficulties due to cuts into public expenditure, therefore, a supplementary source of financing with attractive terms would be very helpful for Municipal Authorities to implement their energy efficiency plans. The agency for running the fund has been defined by the current legislative framework (CDT), so there is no need to proceed to public tenders, taking also into consideration that the proposed size of the fund (€30 mil) is not very attractive for private financial institutions (see also comments of banking institutions' representatives in paragraph 6.2).
2. The Housing energy efficiency initiative, although not mature yet, is a major priority in terms of achieving the national objectives regarding the reduction of energy consumption. Additionally, such an initiative will boost the constructions' industry, taking into consideration that economic environment is deteriorating and constructions' activity is declining (the total area of buildings constructed in September 2009 has fallen by 24,6% as compared to the relative measure in September 2008 – source: Hellenic Statistical Service).
3. The RES initiative, poses eligibility issues, since financing of such projects should be considered in the context of integrated urban development. Therefore, a lot of effort is required in order to conclude to particular projects that comply with the above requirement. Additionally, RES projects are financed in the context of Development Law, with the exception of PPP projects which can be eligible only under certain conditions. However, PPP projects require a long time to mature enough so that to assure a certain level of preparedness which justifies the involvement of financial engineering instruments such as JESSICA.

In what regards the implementation options of each scenario the following options are selected:

- As far as scenario 1 is concerned (Municipal energy efficiency fund) the option 2 is selected, because the fact that eligible Municipal Authorities will be those that are eligible in the context of EXOIKONOMO initiative, does not require state-of-the-art expertise in administering the fund. The energy efficiency related components of the projects will be evaluated in the context of EXOIKONOMO. Therefore, CDT will not be required to practice sophisticated procedures for evaluating loan applications. In addition, CDT possesses the appropriate expertise to provide loans to Municipal Authorities and monitor debt service. Therefore, instead of getting into a public tender procedure it is much more preferable to directly assign this role to CDT. Additionally, this is a small scale initiative which is not attractive to private financial institutions.
- As far as scenario 2 is concerned (Housing energy efficiency fund) the first option is selected, since according to the consultant's view the most important criterion for implementing such a measure is the capability to leverage private resources, so that to enlarge, to the maximum extent, the impact of the initiative. In addition, this option exploits the expertise of specialized institutions in designing and marketing financial products. The implementation option of a guarantee fund, although it solves the problem of assuring debt service, it is an expensive solution since it imposes a guarantee fee on top of the interest rate charged. Since we are in the middle of an economic crisis the major objective should be to ensure the minimum cost for beneficiaries. Moreover, this solution requires two more legislative amendments and probably some organizational (more staff, information systems etc) adjustments into TEMPME's organizational structure.
- As far as scenario 3 is concerned, likewise, the second option is selected so that to leverage private resources, enhance the impact of the fund and utilize the existing investment expertise and projects' pipeline in banking institutions.

7.3 Technical & Operational Characteristics of Proposed UDFs

7.3.1 Scenario 1: Establishment of a Municipal Energy Efficiency Fund

The main technical & operational characteristics of the Municipal Energy Efficiency Fund are summarized into the following table:

Fund endowment	€30 mil
Eligibility	Eligible Municipal Authorities applying for a loan are those that have been approved in the context of EXOIKONO initiative. Municipal Authorities submit the approvals of their energy efficiency action plans by the competent Managing Authority and CDT disburses the loan.
Auditing – Monitoring	In cooperation with the competent Managing Authority of the initiative so that to avoid duplicating procedures
Fund structure	CDT sets up a separate block of finance. Separate accounts are kept which distinguish the new resources invested in UDF, including those contributed by the operational programs, from those initially available in the institution
Governance	Investment Board is the governance instrument of UDF. It consists of representatives of Managing Authorities of OPs that provided resources to the fund, representative of the competent MA of EXOIKONOMO initiative, representatives of the Ministry of Finance and Ministry of Environment and the holding fund operator as well as a representative of Central Association of Municipalities (KEDKE). Investment Board assembles on a monthly basis in order to approve processed applications.
Reporting	CDT submits semi-annual and annual reports to the governors of the fund regarding the progress of fund's investments and financial accounts.
Duration of the fund	12 years
Products	Long term loans with constant quarterly payments. Maximum of loan's duration is 10 years
Grace Period	Maximum 2 years so that to facilitate the time lag between the implementation of the project and the attainment of energy efficiency savings
Interest rate	Interest rate is assumed to be at the level of 2% - 2,5%
Collaterals	Central sovereign resources attributed to each Municipality

Management Fee	1% - 1,5% of total HF capital commitments. Management fee may gradually decrease when all funds are disbursed.
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7.3.2 Scenario 2: Establishment of a Housing Energy Efficiency Fund

The main technical & operational characteristics of the Housing Energy Efficiency Fund are summarized into the following table:

Fund Endowment	Difficult to define. Estimations of demand combined with banking institutions' comments lead us to the conclusion that minimum amount should be no less than €100 mil. The restriction of regulations (4% of ERDF allocation) sets a maximum amount of €494,4 mil.
Eligibility	Households who live in multifamily buildings. Income and areas eligible will be defined by Managing Authorities. Households submit their applications to the fund's operator accompanied by the supporting documentation which justifies their eligibility.
Auditing – Monitoring	According to structural funds' regulations, beneficiaries submit to the fund's operator the appropriate documentation (contracts, invoices, payments etc). On-site inspections are implemented to check the eligibility of interventions.
Fund structure	Banking institution sets up a separate block of finance. Separate accounts are kept which distinguish the new resources invested in UDF, including those contributed by the operational programs, from those initially available in the institution
Governance	Investment Board consists of representatives of: the fund manager, the holding fund manager and the competent Managing Authorities. The investment board is responsible for monitoring the proper implementation of investment strategy, approve processed applications and discuss matters related to operational progress of the fund.
Reporting	Fund manager submits semi-annual and annual reports to the co-financing partners of the fund regarding the progress of fund's investments and financial accounts.
Duration of the fund	12 years

Products	Long term loans with constant monthly payments. Maximum of loan's duration is 7-10 years
Grace Period	Maximum 6 months so that to facilitate the time lag between the implementation of the project and the attainment of energy efficiency savings.
Interest rate	Reference Rate + 200 basis points
Collaterals	Households' assets
Management Fee	2% of total HF capital commitments

7.3.3 Scenario 3: Establishment of a RES Fund

The main technical & operational characteristics of the RES Energy Efficiency Fund are summarized into the following table:

Fund Endowment	Difficult to define precisely. Demand was estimated to €115 mil, however this estimation is not safe due to regulatory issues in maturing these projects. A more safe approach is to let co-financing partners to define the amount to be invested. In any case, this amount should not exceed 50% of total capital commitments.
Eligibility	Private enterprises implementing PPP or other energy generation projects by utilizing RES or other environmentally friendly technologies. In case of provision of equity a special purpose vehicle is eligible for financing, so that not to mix other activities of existing firms with the particular projects that will be financed. Projects are evaluated based on maturity, profitability and the adequacy of their cash flows.
Auditing – Monitoring	According to structural funds' regulations, beneficiaries submit to the fund's operator the appropriate documentation (contracts, invoices, payments etc). On-site inspections are implemented to check the eligibility of interventions.
Fund structure	An independent legal entity which will assign its operation to the fund manager. Specific rules regarding portfolio structure might be

	set (e.g no more than 25% of total capital committed may be invested in one particular project).
Governance	<p>General Assembly consists of representatives of co-financing partners. Assembles annually to discuss matters of investment strategy, operational progress and approval of annual accounts.</p> <p>Investment Board consists of representatives of: the fund manager, the holding fund manager and the competent Managing Authorities. The investment board is responsible for monitoring the proper implementation of investment strategy, evaluate and approve investments and discuss matters related to operational progress of the fund.</p>
Reporting	Fund manager submits semi-annual and annual reports to the co-financing partners of the fund regarding the progress of fund's investments and financial accounts.
Duration of the fund	15 years
Products	<p>Long term loans with constant quarterly payments. Maximum of loan's duration is 12 years</p> <p>Provision of equity is ad-hoc decided according the degree of risk and the potential of cash flows attributed to the fund compared to relative cash flows by loan</p>
Grace Period	Maximum 2 years so that to facilitate the time lag between the construction period of the project and the initiation of operations.
Interest rate	Reference Rate + the appropriate number of basis points based on the credit rating provided to the enterprise according to directive 2008/C 14/02
Collaterals	Project and / or company collaterals
Management Fee	2% of total HF capital commitments

7.4 Action Plan

The incorporation and effective implementation of JESSICA requires a number of initiatives to be developed at central administration level. These initiatives are mostly

related to policy priorities to be set, consultation with stakeholders and the necessary legislative adjustments to be made so that to empower the development of Urban Development Funds in the area of energy efficiency. The following paragraphs describe the activities to be implemented in the short to medium term, the time schedule and the critical success factors.

7.4.1 Description of Activities

The first issue that central administration has to deal with, is to set the policy priorities regarding the financing modes of energy efficiency interventions and specific areas and beneficiaries to be benefited by these interventions. The study concluded to proposed project categories that could be financed by JESSICA in the area of energy efficiency. Project owners were defined, however it is up to central administration to confirm the above proposals, specify the criteria to be used and proceed to specific decisions regarding its priorities. Especially in the case of housing energy efficiency interventions, central administration has to clarify the objectives regarding geographic coverage, socioeconomic criteria to be used and the financing instruments to be utilized in this context.

Consultation with stakeholders is also an important activity to be performed in the context of making the appropriate preparation of UDFs. The central union of Municipal Authorities, the Hellenic Association of Banking Institutions, Regional Authorities and Managing Authorities are the most competent bodies to consult with central administration in order to specify local needs and priorities and to investigate the capability to leverage private resources. In addition, it is critical for stakeholders to understand the revolving character of JESSICA and its significance in local and regional development, since until now grants was the major financing instrument.

The following step for central administration is to decide the organizational structure under which JESSICA will function. The major issue is to decide whether to proceed via a holding fund mechanism or it will directly proceed to the establishment of UDFs. Although the HF mechanism is not obligatory for member states, it seems to be the most appropriate instrument, because it presumes a central organizational scheme which allows for the utilization of significant expertise and experience, thereby accelerating investments. In addition, the need for technical assistance in such an innovative financing scheme is prevalent and the HF structure is most appropriate one to provide it.

In case that the holding fund mechanism will be decided, the next step is to decide whether HF operator will be European Investment Bank or another Financial

Institution. In the beginning of chapter 7 the reasonable assumption was made that EIB will become the HF manager for reasons already explained.

Then, The Ministry of Finance has to proceed to the signature of funding agreement between Greece and EIB and delegate resources from operational programs. The size of the fund, as well as the proportion of resources that will be delegated from Operational Programs is a matter of policy priorities regarding the projects to be implemented in the wider context of sustainable urban development (not only energy efficiency). A ministerial decision has to be issued which will provide for the establishment of the HF and it will regulate the terms and conditions, under which the HF will operate (legal entity, decision making bodies, product categories, beneficiaries, monitoring and auditing procedures, fund management procedures) and the resourced delegated by OPs to the HF.

Then the holding fund will proceed to the establishment of UDFs as described in paragraphs 7.1.1 – 7.1.3.

In the mean time there are other issues to be resolved such as:

- **The specifications of the legal entity of UDFs.** According to the current legislative framework the most proper entity is that of Societe Anonyme. However, in the case that an enterprise provides loans it is considered as a financial institution and it requires a relative permit from Central Bank of Greece. In addition, there are also taxation issues such as income tax and VAT to burden the fund's operations in that case. For these reasons, it is recommended a special legislative provision to be made which will regulate the operation of Urban Development Funds. The main provisions of the law should include:
 - An exclusion of Urban Development Funds from the requirement to get a permit from Central Bank of Greece
 - VAT and income tax exemption. It is recommended to exclude UDFs from VAT while income tax on investment returns to be charged to co-financing partners according to profits distributed
 - Special accounts kept when UDF is financed by Operational Programs
 - Investment Board as a managing instrument of the fund

Legislative provisions of this kind have been made in the case of TANEO (following an approval by the Commission), as well as in the case of special purpose vehicles in the context of Law 3389/2005 regarding public private partnerships.

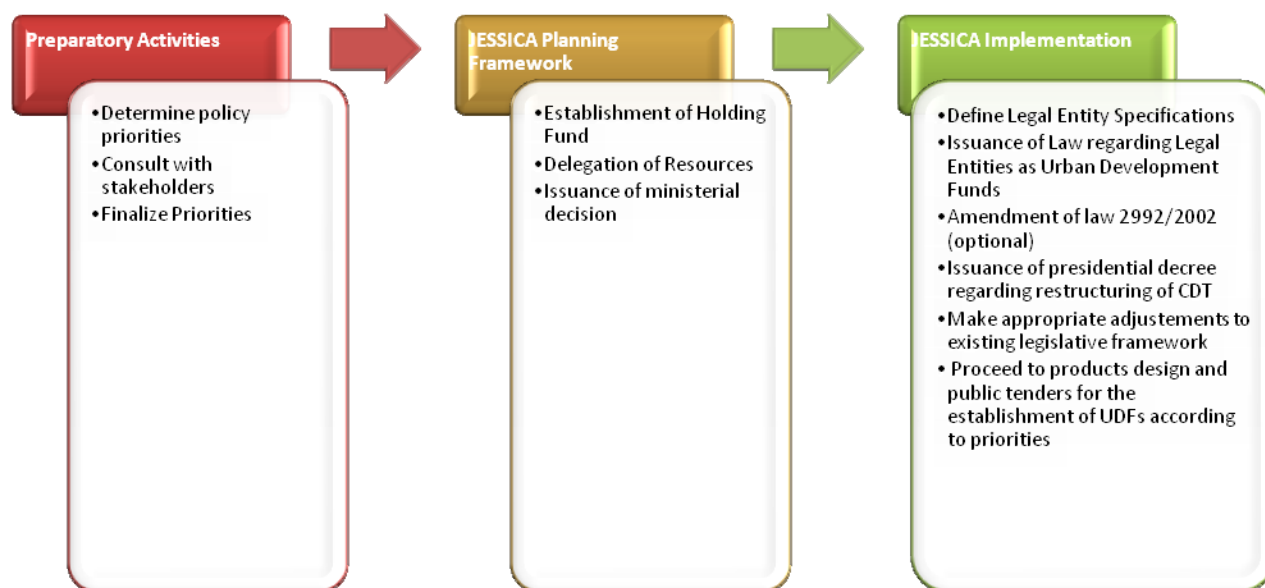
In the case of the RES Fund the entity of Mutual Venture Capital Funds could be an alternative, however the relative law (2992/2002) provides that MVCFs do not have a legal entity and they are represented by the fund manager. Therefore, the national framework is in direct conflict with the regulation 1828/2006 which provides for a specific legal entity. In that case an amendment of the law 2992/2002 should be made.

- **Issuance of the presidential decree**, regarding the organizational restructuring of CDT in order to operate UDFs. This is a necessary activity in case that the Municipal Energy Efficiency Fund is decided to be established and the solution of utilizing CDT is selected.
- **Other legislative amendments related to JESSICA and national law**. It is strongly recommended that national legislative framework to incorporate special provisions regarding JESSICA. An indicative case is the Development Law 3299/04, which provides that loans should be provided by financial institutions. It is recommended to incorporate also Urban Development Funds, since Regulation 1828/2006 does not restrict co-financing from Operational Programs and JESSICA. Another case is the Law 3463/2006 which provides that Municipal agencies are allowed to participate in corporations only if they possess the majority of shares. An exception from this particular regulation should be incorporated when the case is about the formation of UDFs.

The following graph illustrates the appropriate actions as described before, allocated to three stages:

1. Preparatory stage
2. Planning Stage
3. Implementation Stage

Graph 9: Action Plan

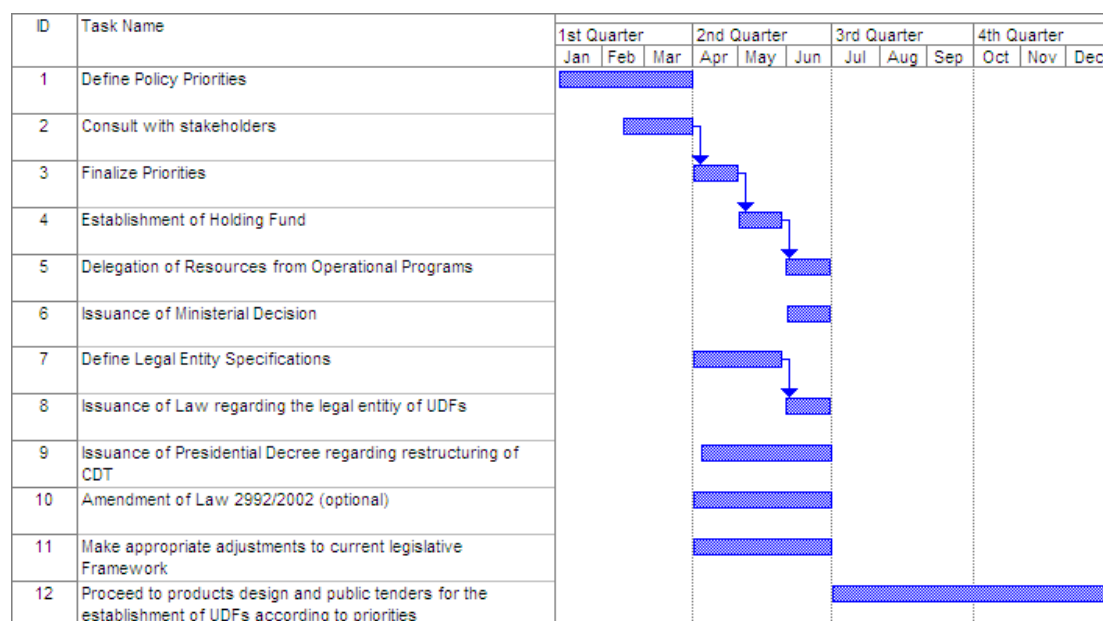


7.4.2 Time Schedule

The time schedule of the action plan has been formulated based on the assumption that the initiation period is January 2010. Since there is an urgency to proceed quickly to the implementation of JESSICA and taking into consideration that we are in the middle of the programming period (2007-2013), the time schedule has been planned in such a way so that to incorporate the urgency of implementation (to prevent losses of NSRF resources) and to be realistic regarding the capacity of central administration.

The main objective of the time schedule is to have the first UDF established no later than the beginning of 2011.

Graph 10: Time Schedule of the Action Plan



7.4.3 Critical Success Factors - Requirements

Current evaluation study has showed that there is an increasing need for energy efficiency interventions identifying three major project categories illustrating a demand for financing (municipal venues, housing and RES projects).

There are some adjustments that should be made in existing national legislative framework. However, these adjustments are considered of minor importance, in terms of implementation requirements.

There are three major critical success factors – requirements regarding the initiation of JESSICA in the area of energy efficiency:

- The first one regards the extent to which central administration will endorse the JESSICA concept and articulate its willingness to proceed to the establishment of such a mechanism for financing urban development projects. That means that JESSICA, should become an integral part of planning as far as NSRF is concerned.
- The second one regards the capability of Greece to quickly proceed to the appropriate measures regarding the development of an efficient energy services market by incorporating directive EC 2006/32. Measures such as the establishment of Energy Service Companies & third party financing as well as energy inspections are the foundation for implementing financial instruments such as JESSICA because:

- They facilitate the revolving character of financing by ensuring that cash flows of the projects will be sufficient to serve the debt
- Energy efficiency interventions, especially in what regards buildings should be based on specific targets regarding the energy savings to be achieved, the proper interventions that should be undertaken derived by energy inspections and on monitoring the results.

Despite the fact that the lack of such a legislative framework is not prohibitive to the incorporation of JESSICA, however, it would facilitate significantly its implementation and its contribution to the general objectives of reducing energy consumption and CO₂ emissions.

- According to observations made by commercial banks' representatives the extent to which JESSICA's implementation will achieve a significant leverage of private resources will depend on the commitment of a critical mass of resources into UDFs, so that their involvement to be beneficiary for them. Although it was avoided to refer to specific amount of money, it is estimated that €50 mil per UDF is a threshold for banks to consider such an involvement.

Annex

As required by the ToR, a shortlist of key players is attached herein

Key Player	Contact Person	Address
Intermediate Management Body for Interventions related to Energy, Natural Resources and Manufacturing	Mr Kleniatis – Director	119 Mesogeion Ave, 101 92, Athens
Managing Authority of OP “Competitiveness & Entrepreneurship	Mr Kokkinoplitis – Director	56 Mesogeion Ave, 115 27, Athens
Managing Authority of OP “Environment & Sustainable Development”	Mr. Alexopoulos - Director	34 Aeropou Papanastasiou str., 115 27, Athens
Central Association of Municipalities	Mr Vasileiou – General Manager	65 Akadimias Ave & Gennadiou, 106 78, Athens
Hellenic Association of Banks	Mr. kabourakis - Director	21A Amerikis str., 106 72, Athens
Directorate of Development Programs – Ministry of Interior	Mr. Zanetopoulos – General Manager	27 Stadiou str. 101 83, Athens
General Directorate of Private Investments – Ministry of Economy, Competitiveness & Shipping	Ms Michalopoulou	5-7 Nikis str, Syntagma Square, 101 80, Athens