BUILD UP SKILLS

ENERGY TRAINING FOR BUILDERS

BUILD UP Skills – Greece

Analysis of the national status quo

February 2013

Further information

More details on BUILD UP Skills can be found at www.buildupskills.eu

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0. Executive summary

The analysis of the Status Quo carried out in Greece in the frame of WP2 of the **BUS-GR** Project aimed at compiling all existing information about the current situation of the building sector, including statistics on Renewable Energy Sources (RES) and Energy Efficiency (EE) in buildings, and to enlighten the scene of existing accreditation and training schemes, as well as of current policies and strategies for the achievement of the 2020 targets. The barriers and gaps between the current situation and the needs for 2020 were also studied. The major players in Greece have been invited to participate in the work carried out herein, to review and comment the results and provide the consortium with their opinions and assessments.

The key information related to the main findings of the analysis is presented in the following box:

- **Number of current workforce in the building sector**

The construction sector employed since 2003 over the 8% of the total workforce in Greece, reaching 9% in the 3rd quarter of 2007. Since then, the sectors' employment is continuously shrinking due to the economic recession (from 2006 up to date, the building permits issued showed an average annual decrease of 20%). In mid-2012 it reached its lowest point (5.6%) at least for the last 15 years. In the time period 2008-2011, 157,000 jobs were cut in the construction sector, 150% more than the ones created for an entire decade (1998 - 2008).

Constructions met the greater impact in employment than any other sector of the Greek economy. The 295,000 employees in the construction sector in 1998 increased to 402,000 by 2008, to fall at 213,500 during the second quarter of 2012, leading to a cumulative loss of 188,500 jobs. Taking into consideration the available statistical data, it is estimated that the absolute number of "blue-collar" workers involved in energy saving and renewable energy installations (and renovations) in buildings – according to the ISCO-08 classification –, i.e. the BUILD UP Skills target group, is currently **109,000**.

- **Current energy consumption in the country and in the building sector**

According to the «*Energy Efficiency Policies and Measures in Greece in 2012*» report, representing the case study of Greece for the IEE project "Monitoring of Energy Efficiency in EU 27, Norway and Croatia (ODYSSEE-MURE)", since 1990 the final energy consumption in Greece has increased by 30%, from 14.7 Mtoe in 1990 to **19.4 Mtoe in 2010**, following the course of both the figures of economic growth and new consumer habits adopted by final consumers. This growing trend mainly comes from the increase of oil consumption by 22.1% and a major increase in electricity consumption by 86.3%. Since 1998, with the introduction of Natural Gas in the energy mix, the final consumption has six times increased and this rapidly growing trend in the near future is expected to be sustained. The final energy consumption of RES has also increased by 29 % over the last 20 years, mainly because of the measure to promote the renewable energy sources in all sectors.

However, both the recession and the implementation of measures to improve energy end-use efficiency have resulted in a significant reduction of final energy consumption in 2008-2010. The total final energy consumption during the period 1990-2007 shows an increasing trend of about 2.41% per year, mainly due to the increased consumption of petroleum products by 2.16% annually, which account for the largest share in the energy mix of Greece, and the average increase of electricity consumption by 4% per year.

The transport sector consumes the biggest part of final energy consumption in Greece with 8.2 Mtoe in 2010 (the amount of energy consumed from transport activities has increased by 39.8% since 1990). Households in 2010 consumed 4.6 Mtoe against 3.1 Mtoe in 1990, namely a 48.6% increase in their energy consumption. Nevertheless, the most rapidly growing sector in terms of energy consumption has been the tertiary sector, as its energy consumption has almost tripled since 1990, following an average growing trend of 6.7% per year. The energy consumption of industry and agriculture remains almost constant and near 1990 levels. The final energy consumption of RES in the households sector has increased by 19.2% over the last 17 years; however this percentage varies from year to year, due to the fluctuation of electricity generated from large hydropower plants.

Minimum levels for the use of RES in buildings are enacted by the "Energy Performance of Buildings Regulation", which makes it mandatory for all new or refurbished buildings in all geographical areas to meet at least 60% of their needs for hot water through solar thermal systems. The Greek solar thermal market has shown resilience under difficult financial conditions. The 161,000 kW_{th} of newly installed capacity in 2011 represented 7.5% growth compared to 2010. An impressive increase in the PV systems in roofs installed capacity was marked the last years. More precisely, in 2012, despite the deep financial crisis, the rooftop PV systems of <10 KW_p reached 300 MW_p. Something similar is expected to happen in the near future with ground source heat pumps.

- **2020 energy targets for the country + expected contribution of the building sector**

The Greek Ministry of Environment, Energy and Climate Change (MEECC), announced on June 21 2010 its plan on how to attain the 20-20-20 climate and energy targets set by the EU. The plan positively describes a major increase in the share of renewable energy sources in the country's energy mix. The Ministry announcement sets a binding national goal of achieving a 20% share by RES in power production (40% share in electricity production) by 2020, which is more than the 18% goal originally set by the EU's renewable energy directive for Greece. 10% of fuel used in transportation is projected to derive from biofuels by 2020. Major investments in renewables are intended to achieve the goal of 4% reduction of greenhouse gas production by 2020, compared to 2005.

As regards energy efficiency, a methodology based on the scenarios studied during the preparation of the National Action Plan for RES (NREAP) was applied in the 2nd National Energy Efficiency Action Plan (NEEAP), submitted to the EC in September 2011, for the calculation of primary energy savings. The total primary energy savings arising under the specific scenarios is equal to 33.1 TWh until 2020. The greatest part of savings is mainly due to the implementation of measures in the final consumption until 2016, most notably due to the measures proposed in the 1st National Energy Efficiency Action Plan (April 2008).

Moreover, savings resulting from the implementation of the projects for the interconnection of the islands with the mainland system, as well as the operations for the upgrade and streamlining of the existing power plants, and the operation of district heating networks were also quantified. What was not actually quantified is the contribution of the various sectors of Greek economy (households, tertiary sector, industry, transports, etc.) to this "target". On the other hand, and as regards the projected increase of RES use in buildings until 2020, according to the 1st NREAP the share of renewable energy in the building sector is planned to reach 30% in 2020 (27% in the residential buildings and 39% in commercial ones).

- **Number of building workers to be trained in each sub-sector/profession to each skill level to achieve the 2020 energy targets**

Currently, the "blue collar" workers of buildings construction industry in Greece are about 109,000 and they should be reinforced with other 10,000 to 90,000, according to the findings

of the analysis made in the frame of the status quo. At the same time, it is commonly accepted the fact of being a gap in the skills of workers regarding the installation of RES systems and the implementation of EE measures related activities in buildings and lack of certification. This recorded gap, in correspondence with the tight targets of Greece for energy savings and RES by 2020, sets as a primary (and urgent) requirement the training of 100% of its workforce in the buildings construction industry. This requirement translates into 119,000 to 199,000 craftsmen, technicians and installers who need to be trained by 2020.

More precisely, the number of "blue-collar" building workers to be trained in each sub-sector/ profession to each skill level to achieve the 2020 energy targets has been calculated as follows (according to the ISCO-08 classification):

- Building frame and related trades workers: from 36,000 (*pessimistic scenario*) to 86,000 (*optimistic scenario*);
- Building finishers and related trades workers (it includes roofers, plasterers, glaziers, plumbers, air-conditioning technicians): from 73,500 (*pessimistic scenario*) to 98,500 (*optimistic scenario*);
- Electrical equipment installers and repairers: from 9,500 (*pessimistic scenario*) to 14,500 (*optimistic scenario*).

- **Qualification needs**

All professionals in the buildings construction industry should be trained with regard to the required skills for RES and/or EE applications. Regarding the priority that might be given, based on the responses of competent bodies to a relevant questionnaire circulated to them, the professions that are deemed to require immediate priority for training are electricians, plumbers (being also installers of RES systems), joiners of windows and/or doors frames, plasterers, and – evidently - bricklayers. This means a total number of between 700 and 1100 training courses that need to be carried out in the 7 years period between 2013 and 2020.

As regards the required trainers, and in line with other economic sectors in Greece and the creation in them vocational training programmes of employees, it is estimated empirically that in every 15 apprentices professionals per year one trainer / instructor is assigned. Thus, taking into account the uniform training of workers in the construction sector within the 7 years remaining until 2020, this action will require approximately 1,900 trainers. It is further not quite sure whether the existing training structures possess the necessary facilities to sustain this huge action (especially as regards the "practical part" of the training), while the whole training and certification/accreditation procedure should follow the national rules and regulations (needs to be compatible with the existing system).

1. Introduction

As energy efficiency (EE) in buildings is crucial for the achievement of the 2020 energy and climate change targets both in the EU and national levels, the EPBD (Recast by Directive 2010/31/EC) has set obligations to Member States to apply minimum requirements regarding the energy performance of new and existing buildings. This poses a major challenge to the construction sector that needs to be ready to deliver high energy performing renovations as well as new "nearly zero energy buildings". Also, the RES Directive acknowledges the importance of training and certification of certain categories of blue collar workers in buildings, namely the installers of small scale RES systems.

Since well qualified construction workers is a key factor for achieving these objectives, but also as learning and gaining qualifications are "upstream" measures, it is now time to act so that a better qualified workforce will be in place to deliver by 2020. Having all these in mind, the European programme "Intelligent Energy Europe" has introduced the **"BUILD UP Skills" Initiative**, which focuses on the continuing or further education and training of on-site / 'blue collar' workers in the field of buildings, strengthening the qualifications of craftsmen, construction workers, systems installers, etc. after their initial, compulsory education and training or after they have entered working life.

In the frame of Pillar I "National qualification platforms and roadmaps to 2020" of the BUILD UP Skills Initiative a very strong consortium, composed of the most prestigious organizations and academic institutions representing the technical and training sectors in Greece, was formed in order to prepare and submit the «BUILD UP Skills – Greece» (BUS-GR) Proposal in the 2nd round of the Call for Proposals for Pillar I national actions (February 2012). The list of partners of the Greek consortium (Project BUS-GR) is:

- Centre for Renewable Energy Sources and Saving (CRES), the coordinator of BUS-GR,
- National Technical University of Athens (NTUA), more specifically the Decision Support Systems Laboratory of the School of Electrical and Computer Engineering of NTUA,
- Small Enterprises Institute of the Hellenic Confederation of Professionals, Craftsmen and Merchants (IME GSEVEE),
- Technical University of Crete (TUC), more specifically the Renewable and Sustainable Energy Systems Laboratory (ReSEL), Environmental Engineering Department of TUC,
- National Organization for the Certification of Qualifications and Vocational Guidance (EOPPEP),
- Technical Chamber of Greece (TEE),
- Labour Institute of the Greek General Confederation of Labour (INE-GSEE),
- Region of Western Greece,
- Centre for Educational Policy Development of the Greek General Confederation of Labour (KANEP- GSEE).

Apart from the BUS-GR partners, there is a large number of stakeholders involved following to the continuous efforts of the consortium to assure their actively supporting role in the BUS-GR project, including the Ministries in charge of the energy and life-long learning issues in Greece, sustainable buildings experts, associations for RES – EE building products/ companies, building industry related research institutes, the federations of buildings technicians, accreditation and certification bodies, the "social partners". In total 26 Letters of Support were gathered by such bodies, in support of the BUS-GR proposal. When the project started, and after a structured communication procedure aiming to achieve all key stakeholders participation in the National Qualifications Platform (NQP), much more entities have joined the common effort in Greece, this time including the Ministry of Labour, Social

Security and Welfare, the Greek Manpower Employment Organization (OAED), but also the collective bodies of the providers of CVET courses in Greece.

The ultimate objective of every project accepted for funding under the Pillar I of the BUILD UP Skills Initiative "National qualification platforms and roadmaps to 2020" – in all 30 European countries participating in the Initiative, and in Greece too – is the development of a national roadmap (a national training and qualification strategy) up to 2020 to embed the training on intelligent energy solutions for buildings in the mainstream curricula and practice of building professionals targeted by the initiative (craftsmen and other on-site workers). Based on a complete **analysis of the national situation**, the **roadmap** should take into account the expected contribution of the building sector to the national 2020 targets and the requirements for 'nearly zero-energy buildings'.

So, a very crucial step in the whole procedure is the identification and quantification of the need for qualified workforce in Greece in order to describe the current status quo. This activity, as a first, concrete step towards the roadmap's elaboration, aimed at identifying a list of challenges for the future, including barriers and needs for training, training providers and quantified data for the need of skilled workers for the time horizon till 2020, following an exhaustive analysis of the current scene of existing qualification and training schemes, as well as current and planned policies and strategies in Greece, and comprised the work made in the frame of WP2 "Analysis of the national status quo" of BUS-GR.

This report is structured in 9 distinct chapters (apart from the "Executive summary", appearing as Chapter 0), in accordance with the guidelines provided in the framework of the implementation of the project. In the first chapter, the purpose of the "BUILD UP Skills" Initiative and of the corresponding "BUILD UP Skills – Greece" project, as well as the structure of the report is presented. The second chapter outlines the scope and objectives of the report, as well as the approaches followed and methodology applied to collect and analyse relevant data and information. In the third chapter, the background and main characteristics of the Greek building sector are briefly analysed, along with assessments of the market trends and the future development of the sector.

In the fourth chapter, the national policies and strategies that will contribute to the EU 2020 energy and climate targets – with special emphasis in buildings - are analysed, especially the energy policies for the building sector and the national policy and strategy related to green skills and jobs, but also the national implementation of European Qualifications Framework (EQF) and other EU education and training policies in the building sector. In the fifth chapter, extensive statistical data on the building/construction sector are presented together with the energy performance of the building stock in Greece, and data on employment in the buildings construction sector are presented and analysed.

The sixth chapter presents the current situation regarding the continuing or further vocational education and training of craftsmen and other on-site construction workers and systems installers in buildings, including the mandatory requirements / obligations and how the existing schemes are actually used. Chapters 7 and 8 provide an in depth analysis of the gaps between the current situation and the 2020 needs, and the potential barriers and obstacles related to the qualification of the building workers, respectively. Finally, the report ends with the main conclusions drawn up when compiling all those data in chapter nine.

It must be further mentioned that, as regards the references / sources, these are indicated in each point they are used (or reference is made to them) as a footnote. So, no specific chapter is used in this Report for the citation of the references / sources used.

2. Objectives and methodology

2.1 Purpose of the Status Quo Analysis report for Greece

The objective of the work carried out in the frame of WP2 "Analysis of the national status quo" of the BUILD UP Skills – Greece (BUS-GR) Project was to frame and quantify the need for qualified workers in the building sector in Greece by 2020 (and beyond), to analyse the current scene of existing qualifications of the building workforce and training schemes available to them, as well as all current and planned policies and strategies in the fields of energy and continuous vocational education and training that contribute to the achievement of the national and EU 2020 energy targets in buildings.

In the national status quo analysis all professions involved in the building sector were included, namely:

- Tradesmen: bricklayers, carpenters, plumbers, electricians, roofers, plasterers, glaziers, concrete workers, etc;
- Supervisors / contractors, working on site and more specifically on groundwork, walls, roofs, windows, doors, chimneys, heating / cooling systems, air handling, lighting, other services, etc;
- Renewable energy system installers for small-scale biomass boilers and stoves, solar PVs and solar thermal systems, shallow geothermal systems, heat pumps;
- Specialists who select / size / check / inspect installations for gas boilers, oil boilers, solid fuel burners, underfloor heating, radiators, air handling units, cooling / air conditioning plant, etc.

This activity, as a first/concrete step towards the roadmap's elaboration, identified a list of challenges for the future, including barriers and needs for training, training providers and quantified data for the need of skilled workers for the time horizon till 2020. In order to achieve all the above, a well structured approach was used, consisted of various levels, as is analyzed in the following paragraphs.

2.2 Approach and methods used to collect and analyse relevant data and information

2.2.1 Mapping of the current situation as concerns continuing education and building sector

Mapping of the education sector concerned the depiction of the current situation about the:

- National System for VET as applied in the building sector (legal and normative framework including NQF development status, existing qualifications, recognition models, procedures for validating training courses, trainers and training providers, involved institutions), and the extent to which the current system already addresses necessary skills for high quality application/ installation of RES and EE systems in buildings;
- Existing training courses and certification schemes on RES and EE in buildings which are not (yet) part of the National System for VET (crafts / knowledge and skills areas covered, training providers, number of courses/year, workers attending/year, training approach, trainees' assessment procedures, certification, etc.).

Data gathering was based - among others - on the National System for VET and the existing training courses and certification schemes (either acknowledged by the State or supported by professional associations or chambers). The current situation was compiled taking into

account desk research findings, evaluating existing initiatives and data from interviewing relevant organizations and national bodies. In order to avoid duplication of efforts and to exploit potential synergies with other EU funded projects (such as the QualiCert, Install+RES and PVTRIN Projects, in which CRES and TUC are involved in), the consortium made use of any existing information derived from them and related to the above mentioned issues.

Mapping of the building sector was focused on the identification of the current status in the building stock, its energy consumption, RES penetration in buildings, supporting schemes, etc., including current statistics on EE and RES in buildings (energy consumption, RES contribution), as well as quantified data on the current workforce in the sector (by craft and skill levels). The appropriate stakeholders were also identified and recorded. Statistical data have been drawn by published reports from various statistical organizations (e.g. the Hellenic Statistical Authority - EL.STAT., the Foundation for Economic & Industrial Research - IOBE, Eurostat, the Organisation for Economic Cooperation and Development – OECD, etc.). In addition, the relevant stakeholders (such as the Energy Directorate of MEECC, and the related institutions of TCG, GSEE, GSEVEE, etc.) were inquired to gather, assess and compile unpublished raw data (not included in published reports).

Also, for compiling the above data more efficiently, fast and with accuracy, the consortium (with the leadership of TUC, being the Task leader) first interviewed the involved departments of national authorities, and developed communication channels with interested stakeholders, considering their statutory role, while two closed working meetings with the MELLRA were made, where partners presented the first findings and gathered additional information and comments from the ministry's executives.

2.2.2 Mapping of the national policies and strategies

An extensive mapping of current and planned policies and strategies in the energy field on the one hand, and in the field of green skills and jobs, on the other hand, have been made herein. This task was further divided in two distinct subtasks, namely:

- **Energy national policies and strategies** aiming to address the pillars of the national policies regarding energy, including:
  - National policy and strategy to meet the 2020 targets and the envisaged contribution of the building sector, within the framework of the NREAP;
  - National policy and strategy within the framework of the NEEAP;
  - National plans to implement the EPBD recast in order to deliver high energy performing renovations and new, nearly zero energy buildings;
- **Workforce national policies and strategies** for addressing the issue of the national policies regarding the workforce continuing education and training, paying emphasis on the National strategy towards green skills and jobs.

The stakeholders inquired during the data collection were basically the involved ministries. CRES (the task leader), as the National energy agency in the fields of RES and Energy Efficiency, is also the body with in depth knowledge on the policies and strategies, especially in the energy field. Key representatives from the competent Ministries have been each time invited to support this effort, considering their statutory role, taking into consideration the political framework and new policies in the energy and lifelong learning fields. In addition, two closed working meetings with the MEECC were held in order to discuss priorities and gaps as regards the legislative and regulatory framework in the field of energy, as well as to define an overview of current and planned policies and strategies.

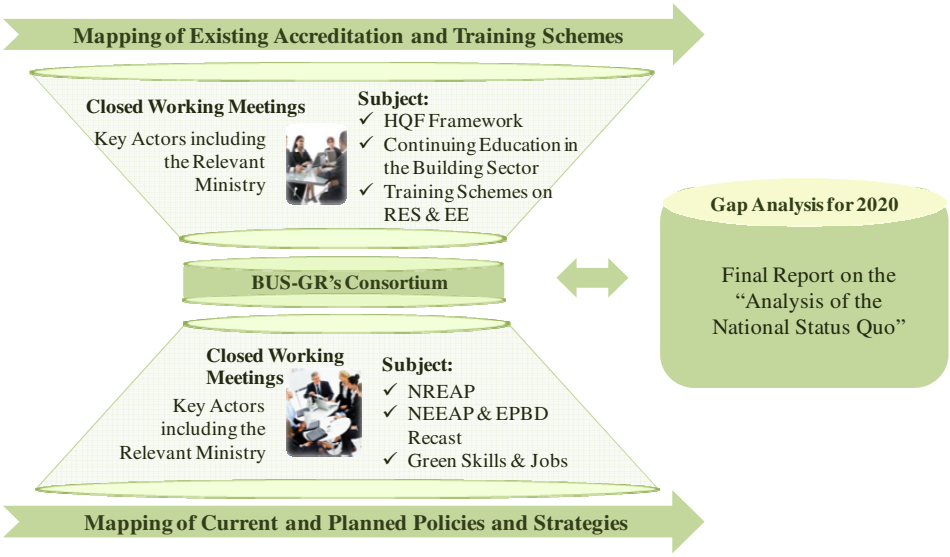


Figure 2.1: Engaging the stakeholders in the mapping of training and certification schemes and relevant national policies and strategies

2.2.3 Needs analysis for 2020

This task aimed at the identification of barriers and gaps between the current situation and the needs for 2020 targets, emerging from the cross-analysis of the results of the previous Tasks. Within the framework of this task, the consortium (mainly the team of EPU/NTUA, as task leaders) quantified the following needs and gaps in the building sector:

- Numbers of workers to be trained in each sub-sector/profession and skill level;
- The strategy for providing that training in order to reach the targets;
- Needs in terms of structures for carrying out the training.

To estimate the so-called **labour force gap**, the methodology was divided into two stages:

- In **Stage A**, the workforce that will be required to have entered the industry and trained by the end of the decade for the energy upgrade of existing buildings was estimated. The workers were evaluated per class building activity separately.
- In **Stage B**, the estimated number of workers who will be required to enter the construction industry as a whole to meet future construction activity until 2020, according to the energy patterns of the EU, was derived. The steps followed in Stage B were as follows:
  1. Step 1: A prediction of future construction activity in Greece in the form of scenarios (reference, optimistic, pessimistic) until 2020 was made.
  2. Step 2: Through the scenarios, the workforce that will compose the Greek manufacturing sector as a whole at the end of the decade was estimated.
  3. Step 3: The specific number of craftsmen working at the construction and finishing of buildings and other construction works in 2020, which is the category of employees who are targeted by this report, was calculated.

The stakeholders engaged in the procedure are representatives from the relevant national authorities, social partners, technicians' associations, etc., according to the needs encountered. Basic tools towards the efficient and quick compilation of the information received were the:

- Implementation of unofficial work meetings (face-to-face or through the use of ICT means) with the key stakeholders, according to the needs;

- Identification of each partner's distinct role in the communication with the key stakeholders;
- Engagement of senior experts in the discussions with the key stakeholders.

2.2.4 Compilation of the National status quo Analysis report

All the above mentioned procedures (gathering of information, analysis, processing of results) led to the development and composition of an initial draft version of the National status quo Analysis report. This version (in Greek) was distributed to the most relevant stakeholders, mainly national authorities and key associations, so as to receive valuable feedback from them. Indeed, the representatives from relevant national authorities, social partners, employers (companies active in the construction sector, providers of materials and/or equipment, etc.) associations, technicians' federations, etc. (i.e. all the members of the National Qualification Platform) have been asked to review and comment the results and to provide the consortium with their opinions and new inputs. Based on the above outcomes, the initial draft report was reviewed and edited in light of the input received in this task, producing the final version of the analysis (D2.3 – Final Report on the Analysis of the National Status Quo).

3. Characterisation of the building sector

Buildings are an extremely important sector for the Greek economy. The construction sector, which includes private construction activity, public works and co-financed projects, consists one of the most dynamic sectors of the Greek economy, with the participation of around 8% of the GDP, while the direct and indirect employees in the construction and the dependent sectors amounted to 400,000 people, according to the data for 2007.

On the other hand, the construction sector in Greece experienced a rapid growth in 2000 but only until 2005 and since then there was a huge decay due to the economic recession. A big benefit for the construction sector which helped to its increase was the implementation of the 2004 Olympic Games by Greece, leading to a huge increase in the number of construction companies. The growth was fostered by favourable developments in the sector of residence and the fall of mortgage rates. However, the year 2005 has been a recession year for the constructions.

So, four years later at the same period (3rd quarter of 2011), only the 51% of the above mentioned 400,000 workers in the constructions sector have kept their jobs due to the economic recession (reaching a number of total employment of approximately 205,000). Construction industry employed since 2003 over the 8% of the total workforce in Greece, reaching 9% in the third quarter in 2007. Since then, the sectors' employment is continuously shrinking and it has reached its lowest point (5.6%), at least for the last 15 years.

One of the biggest issues that the Greek government has to manage is the high immigrant illegal labour due to the high social security taxes. Indeed, the "black labour" as it is called in Greece is a diachronic characteristic of the constructions sector. In a recent survey made by the Special Unit for the Monitoring of Social Insurance (EYPEA) of the Social Insurance Institute (IKA) of Greece and the Labour Inspectorate (SEPE), it was found that from the total amount of inspected workers the percentage of unregistered labour raised from 12% in the prefecture of Magnesia (Thessaly) up to 78% in the prefecture of Arcadia (Peloponnesus). More general, during the first semester of 2012, in 30,000 workers inspected, about 9,500 foreigners were found to work without any insurance coverage, and this number represents the 47.4% of the foreigners and the 35.4% of the total unregistered labour.

Some specific features of the Greek housing market that justify all the above are the high rate of home ownership (over 80%), low mobility of the land market, as well as the high transaction costs and the low trading volume over the building stock. On the other hand, the building sector in Greece accounts for one third of the emissions of carbon dioxide (CO_2) and for 36% of total energy consumption. In our country, the CO_2 emissions from the building sector had - before the crisis period - an annual growth rate of around 4%, while constantly inflated in absolute energy consumption of buildings.

At the same time, the growth rate of consumption in buildings is very large. It is characteristic that during the period 2000-2005, their energy consumption increased by 24%, reaching 8.54 Mtoe, and this is one of the highest increases in Europe. Furthermore, according to the Energy Balance for the year 2009, the energy consumption associated with buildings (residential-commercial, etc.) in Greece amounted to 7,877 ktoe, which corresponds to 35% of the total energy consumption, while the consumption in the residential sector represents 22%. These data demonstrate both the exceptional importance of the building sector in the overall energy balance, while the huge potential (possibility) for the reduction of the energy consumption in buildings and the improvement of their energy performance is emerging.

The Greek buildings have high energy consumption. According to Eurostat, the Greek households show - with climate adjustment - the higher energy consumption in Europe,

approximately 30% greater than that of Spain and about double the consumption in Portugal. It is also important to mention that, this “climate adjusted” energy consumption is significantly higher in comparison to that of countries with definitely colder climates, such as Belgium and the Nordic countries (Figure 3.1).

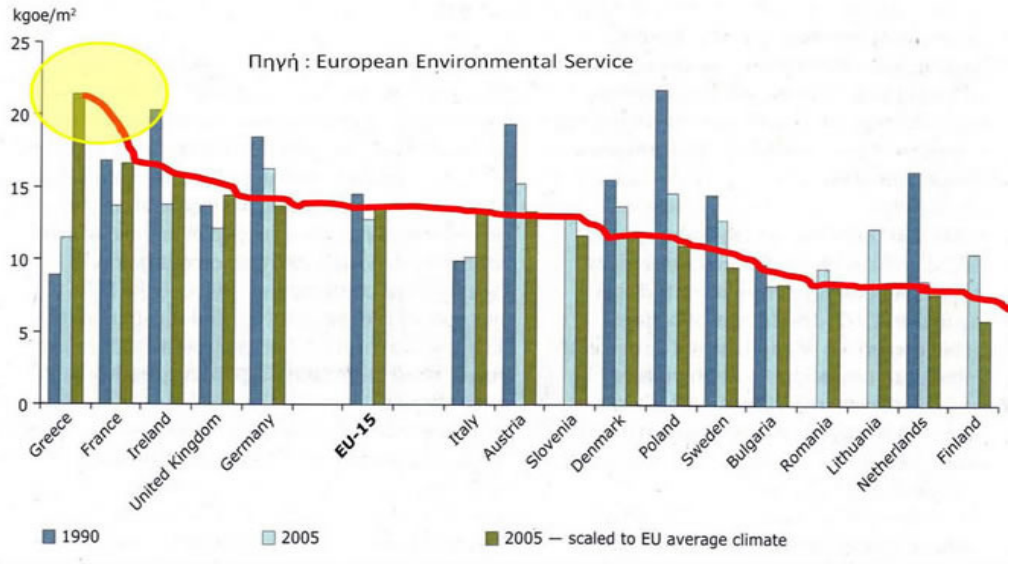


Figure 3.1: Climatic adjusted household energy consumption for heating in Greece and other EU countries

On the same time, the energy consumption of commercial buildings is extremely high, and the relevant statistics have shown that, for example, the energy consumption due to offices operation in Greece is comparatively the highest among all European countries.

The inadequate protection of existing buildings from the external environment, the unorthodox design of new buildings as a consequence of an environmentally detached architectural concept that ignores the local climate, the urban climate change, the age (oldness) of the buildings, and the complete lack of contemporary legislation for about 40 years, in terms of energy and environmental protection of buildings, resulted in:

- the massive expansion of the energy balance of the country,
- the financial and social compression of the lower income groups,
- the increase of the energy poverty in the country, and,
- the - for a long time - violation of the international commitments of the country for the environment, such as the Kyoto agreement, the Directive 2002/91/EC of the European Parliament and of the Council of the European Union on the Energy Performance of Buildings ("Energy Performance of Buildings Directive", EPBD).

But, which are the reasons for this situation?

a. The fact that the large majority (nearly 65%) of the buildings constructed before 1980 are not thermally insulated, and thus they require very large amounts of energy to ensure the current levels of acceptable comfort conditions during winter.
b. The - in general terms - medium condition of heating systems, which leads to reduced efficiencies and therefore an increased energy consumption and environmental impact.
c. The continuous increase of the systems and appliances that consume electricity, both as regards their number and their installed capacity. This applies to residential buildings, mainly, however, office buildings, shops and services as well.
d. The increasingly strong demand for improved living and working conditions, particularly regarding the thermal comfort during summer, which coupled with the lower cost of

equipment, led to the installation of over 3,000,000 units of air conditioners in the last 25 years.

The energy consumption of buildings is directly related to social and economic factors. In a recent research on the social dimension of energy in buildings and the building environment it was found that the surface and the thermal quality of buildings and their energy consumption is directly related to the income of the residents. It is characteristic that:

- The average area surface of a residence belonging to the highest income groups is higher by 115% than in the case of the low income ones.
- There is considerable variation - depending on the income - of the percentage of families living in sheltered buildings of high environmental quality. Only 8% of the low-income people live in buildings with double glazing and insulation, while for high-income people this percentage reaches 64%. This fact has important impacts for both energy consumption and the thermal comfort in buildings.
- As a result of the differentiation in the quality of the buildings, it was found that there is a high consumption of heating energy per square meter for the very low and the very high income groups. The heating cost per person and unit surface is by 127% higher in the low income groups in comparison to the high income ones.
- The cost of air conditioning is much higher in low income groups, being around 195€ per family, while the corresponding cost for an average income family is 100€.
- In 2004, the low income rate of households suffering from fuel poverty was up to 16%. Given the increasing fuel prices since 2006, the percentage of the population suffering from fuel poverty rose from 1.6% to 8.4%. For the lower income families, fuel poverty rose from 16 to 36%. The average percentage of households in fuel poverty rose from 11.3 to 21.1%. The corresponding figure for low income families increased from 40% to 60%.
- The thermal problem faced by low income people during the summer, can lead to significant problems of survival. Measurements of the internal temperature in low income dwellings showed that for about 50% of the period the internal temperature was above 34℃, reaching up to 42℃. Given the increased occurrence of heat waves, and because of the warming effect of the “heat island” phenomenon, the low-income population is the first victim of climate change and should be taken care of in order to achieve an improvement of the quality of buildings.

4. National policies and strategies to contribute to the EU 2020 energy targets in buildings

4.1 National policies and strategies in the field of energy

4.1.1 National energy policy and strategy to meet the 2020 targets (with the envisaged contribution of the building sector)

Prior to the Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006 on Energy end-use efficiency and energy Services (ESD) process, Greece did not have a quantitative energy saving target. The ESD and EPBD, in particular, have been instrumental in changing this. The ODYSSEE national report[1] cites energy efficiency as the 'second axis' of Greek energy policy, after the renewables target. The overall target set in the 1st National Energy Efficiency Action Plan (NEEAP), corresponding to the nine per cent (9%) by 2016, is 18.6 TWh, with the sectoral break down being: residential 5.5 TWh, tertiary 5.7 TWh, industrial 0.7 TWh, and transport 6.7 TWh. It is enshrined in law, though the sectoral allocations are nonbinding.

The target was set, mindful of the 2020 objective, following an analysis of the economic potential for energy efficiency, and progress against it is measured using top-down methods. Lesson learning and evaluation is through the ESD reporting procedures, and compliance with the ESD compliance has been the primary driver. Delays to the implementation of the NEEAP have led to the suggestion that the residential and tertiary targets will be difficult to meet, though still achievable. The high fuel costs and savings on offer for households mean that the achievement of these targets is politically important.

In addition to the NEEAP target, a measures-based target is in place that requires all lighting outlets in public buildings have to meet a minimum energy efficiency rating of B by 2016. The target is legally binding and predicted to save 0.3 TWh by 2016. Legally binding targets for new buildings ensure that new public buildings from 2014, and all new buildings from 2019, will be required to cover all their primary energy needs using renewable energy sources, cogeneration systems, district heating systems or high efficiency heat pumps.

The most effective targets are those that are linked driven by the EPBD (and its recast), since they are underpinned by legislative actions and mandatory measures. Indeed, the delivery of energy efficiency in the buildings sector is viewed as being quite successful, with special incentives and new regulations. The transport sector is viewed as being both the most challenging and the one where targets have been least effective, due to the heavy reliance on road transport.

It must be further mentioned that, the new Directive 2012/27/EC with its Article 3, demands the adoption of new indicative target for energy efficiency for the Member States, the calculation of which will be based either on the primary or final energy consumption, or on the saving of primary or final energy, or on the energy intensity. In Article 4 of the Directive 2012/27/EC, the target of an annual refurbishment of the 3% of the total floor area of the central public administration buildings is further instituted. In the same Article, the long-term strategy for the actuation of investments for the refurbishment of the national building stock is also defined.

Energy intensity targets have been called for, as this would take into account changes in economic activity, together with changes in energy consumption. Energy intensity is seen as

[1] IEE project "Monitoring of Energy Efficiency in EU 27, Norway and Croatia (ODYSSEE-MURE), National reports: http://www.odyssee-indicators.org/publications/national_reports.php

the government target which is easier to be accepted, and overall reduction in energy consumption seems as the most difficult. A target to improve primary energy intensity by 15% by the year 2020 is considered as an achievable target. The development of market mechanisms, such as Energy Service Companies (ESCOs) to promote energy efficient services will significantly help in this direction, especially in tertiary sector buildings, where such actions should be supported both financially and regulatory.

Legally binding energy efficiency targets should be enforced, using a similar burden sharing process to the RES target. Such a target would supplement rather than compete with the RES and EU ETS, helping to better align renewable and energy saving opportunities. More action on energy saving would reduce the absolute amount of renewable energy required, making it easier to meet that target.

A mandatory target would stimulate Energy Efficiency investments via the legislative actions and fiscal incentives that would likely only be implemented were such targets set. Ultimate responsibility for the targets should lie with the Ministry/Government, but the monitoring process should be allocated to the relevant energy agency [CRES was suggested] with the obligation for the other public organisations/ministries to develop a structure/system for monitoring the progress. The transport and building sectors were identified as having the highest levels of consumption at present, and the greatest potential for reductions. Mandatory 'umbrella' targets could firm up existing targets is these areas, and allow further regulations upon market actors (e.g. energy utilities, industry non-EU ETS).

In relation to the 2020 objectives, it must be also mentioned that the Member States are expected to report on the 2020 energy efficiency objective in their National Reform Programmes (NRPs), which are submitted to the Commission every three years. NRPs describe what each country is doing to meet the EU's shared 2020 objectives under the Lisbon Agenda, and the '20:20:20' energy policy objectives are a part of this. The latest round of NRPs was more or less finalised at mid 2011. So, the **National Reform Programme** (NRP) of Greece[2] reports (in page 45) an objective of a 15% improvement in primary energy efficiency by 2020. No further details are provided.

The 2nd National Energy Efficiency Action Plan (NEEAP), submitted to the EC in September 2011, presents the aggregated data of the national strategy for energy savings in all sectors of final energy consumption. It describes and evaluates all the measures that have been, are being or are planned to be implemented to energy end-use sectors in Greece and includes an extensive description of the energy savings achieved through energy efficiency improvement measures by direct reference to the 1st NEEAP. It also presents the progress in meeting the interim target for energy savings in 2010 based on data and estimates, and makes a forecast on energy savings for 2016.

According to the 2nd NEEAP, the intermediate target for energy savings has been exceeded, mainly due to the economic recession and not to the triggering of the measures specified in the first NEEAP. The interim final energy savings target for 2010 (5.1 TWh) is achieved. However, energy savings may not be largely attributed to energy efficiency measures. The achievement of the interim target is mainly due to the impact of economic recession in the final energy consumption, which specifically in the residential and industrial sector has been observed since 2009, while in the transport sector the impact has been observed mainly since 2010 onwards.

Regarding **RES**, it must be mentioned that the initial target of 18% set by Directive 2009/28/EC was changed through the adoption by Parliament of Law L3851/2010, which came into effect on 4th June 2010, and in which the ambitious national target for RES of 20%

[2] Greece's final NRP, available at: http://ec.europa.eu/europe2020/pdf/nrp/nrp_greece_en.pdf

on final energy consumption (2% above the mandatory level of 18%) is specified. It further sets specific targets for RES electricity share (40%), RES heating and cooling share (20%), and RES transport share (10%) in order to achieve the national target of 20% contribution of the energy produced from RES to the gross final energy consumption.

According to the National Renewable Energy Action Plan (NREAP) that was submitted by the MEECC to the EC in June 2010, for RES-E the installation of almost 7.5 GW of wind energy plants is foreseen, together with 2.2 GW of PVs, 250 MW of CSP plants, 120 MW of geothermal energy, 250 MW of bio-energy installations (biogas and solid biomass), 250 MW of small hydro plants and an additional capacity of large hydro plants (350 MW) and pumped storage plants (880 MW), resulting in a 40% RES share in electricity production. The intended share of RES installed capacity has been changed since then (according to a MD of the Minister of EECC of October 2010), and now is as follows:

Table 4.1: Intended installed capacity of RES with a time horizon the years 2014 and 2020

	2014	2020
Hydropower	**3700**	**4650**
Small hydro plants (0-15 MW)	*300*	*350*
Large hydro (> 15 MW)	*3400*	*4300*
Photovoltaics	**1500**	**2200**
Plants from the special program for professional farmers	*500*	*750*
All other installations (in roofs, PV parks, etc.)	*1000*	*1450*
Concentrated solar power (Solar thermal)	**120**	**250**
Wind energy (including offshore farms)	**4000**	**7500**
Biomass (including biogas)	**200**	**350**

The higher penetration of RES in the electricity generation is planned to be achieved through the implementation of coordinated fiscal, regulatory, physical planning and technical measures that are targeted to exploit the economic potential for development of large RES plants, to complete the necessary grid infrastructure works, to work towards the establishment of a distributed power generation structure in the planning of new power plants and to facilitate the gradual decommissioning of the old inefficient thermal power plants.

The RES-H target will be achieved mainly through the continuous growth of solar thermal installations in the residential and tertiary sector, the stabilisation of the biomass share in the residential sector, and the gradual penetration of heat pumps. For this purpose, new financial incentives for the support of the heat production from biomass and geothermal energy have been put in place or are planned.

Although solar thermal applications already have a significant penetration in the Greek building sector, new legislative framework passed in 2010, along with the technical requirements that are set by KENAK - the “Energy Performance of Buildings Regulation” - that stresses the obligation for new or refurbished buildings to meet 60% of their needs for hot water through solar thermal systems, is expected to contribute further. The new building regulation will act as the main legislative tool for the promotion of RES systems for heating and cooling at the tertiary and residential sectors but also in the industrial and agricultural sectors.

As regards the RES-Transport field, the penetration of biofuels by 10% until 2020 in the transport sector will be achieved through a combination of regulatory actions targeted to promote both the use of more energy-efficient vehicles and the consumption of biofuels in substitution of fossil transport fuels. Emphasis will be put on the domestic production of the

required amounts of biodiesel, on the exploitation of the local biomass potential with the cultivation of energy crops for biofuels and on the development of the necessary supply chains in order to assure a significant contribution of the domestic agricultural production.

Also, according to the NREAP, the projected increase of renewable energy use in buildings until 2020 (with differentiating between residential and commercial, public and private sectors, and including both heating and cooling and electricity consumption from RES) is as shown in the following table:

Table 4.2: Estimated share of renewable energy in the building sector

Sector	2005	2010	2015	2020
Residential	15%	17%	22%	27%
Commercial	10%	14%	27%	39%
TOTAL	**14%**	**16%**	**24%**	**30%**

Last, but not least, it is important to mention that the NSRF (National Strategic Reference Framework) 2007–2013 constitutes the reference document for the programming of EU Funds at national level for the period 2007–2013. The country's strategic planning for the period 2007-2013 is to be implemented through Sectoral Operational Programmes, Regional Operational Programmes and European Territorial Cooperation Programmes.

4.1.2 Relevant national building codes and regulations, and RES obligations in buildings

The main actions and measures that were launched from 2007 onwards as part of achieving energy savings target at a rate of 9% in end-use until 2016, were implemented at national level and mainly involved the development of the institutional and regulatory framework for adopting policies, obligations and strategies in all end-use sectors, as part of improving energy efficiency. Specifically, a comprehensive institutional framework for the energy efficiency and certification of buildings, the technical specifications of new buildings, the obligations of the public sector and energy providers, and the mechanism to monitor and assess progress in the achievement of the national target was developed.

The main legislations in force (in the form of Laws, Ministry Decisions - MD, Presidential Decrees – PD, and Legislative Acts) adopted for introducing energy efficiency and rational use of energy in buildings in Greece, but also for increasing the share of energy from renewable sources in the building sector, are the following (by chronological order):

- "Measures to reduce energy consumption in buildings and other provisions" (**L.3661/2008**) - The main articles of the law, implementing Directive 2002/91/EC in Greece, concern building codes and minimum requirements for Energy Efficiency in new and existing buildings (buildings energy performance certificate in all existing buildings; energy auditing of the building envelope, inspection of boilers and air condition systems). In addition, this law requires that passive solar systems as well as heating /cooling/ electricity production systems that utilise RES and CHP must be considered in the H/C specification study submitted in the licensing procedure of buildings thus promoting the installation of small-scaled RES technologies.
- Decisions 16094/08-04-2008 (OG B 917) and 16095/08-04-2008 (OG B 925) of the Deputy Minister of Ministry of Environment, Public Works and Urban Planning: These decisions integrate PV systems in the provisions already applicable for solar collectors.
- "Measures to improve energy efficiency and energy savings in the public and broader public sector" (MD D6/V/14826/17.6.2008), where a connection with the natural gas network is made mandatory.

- Ministerial Decree D9B,D/V166/oik.13068/11.06.2009 (OG 1249/B/2009) that defines, streamlines and facilitates the licensing procedure and framework for the exploitation of geothermal resources for own use through energy systems (ground source heat pumps) for space heating and cooling of a building.
- "Establishment of harmonized reference values of efficiency for the separate production of electricity and thermal energy" and "Specify details of the method of calculation of electricity from cogeneration and efficiency cogeneration" (MD D5-IL/G/F1/oik.15606 & 15641/15.7.2009).
- "Adoption of Energy Performance of Buildings Regulation" (MD D6/V/oik.5825/9.4.2010) – The **"Energy Performance of Buildings Regulation"** - KENAK - stresses the obligation for new or refurbished buildings to meet 60% of their needs for hot water through solar thermal systems. For the proper implementation of this regulation, in relation also with domestic RES systems, the Technical Chamber of Greece will issue a guidebook about the technical instructions for "RES installations in buildings".
- "Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations in topics under the authority of MEECC" (**L. 3851/2010**) - This law complements L. 3661/2008, by setting new requirements that stipulate the coverage of 60% of the need of new buildings for hot water by solar thermal systems after 1 January 2011. Additionally, all new buildings' construction or major renovation requires henceforth a full energy analysis study that includes energy conservation and cost/benefit analysis of the utilization of RES, cogeneration, district heating, and heat pump systems. Furthermore, L. 3851/2010 stipulates that by 31.12.2019, all new buildings must cover the total of their primary energy consumption with RES, CHP, and district heating on a large area scale/block scale as well as heat pumps. This requirement is extended to all new public buildings by 31.12.2014 at the latest.
- "Measures to improve energy efficiency in end-use, energy services and other provisions" (**L. 3855/2010**), and in particular Article 8 for energy efficiency measures in the public sector and Article 16 on the energy performance contracting framework. This law, which transposes Directive 2006/32EC, foresees specific measures for the buildings of the public sector in order to improve their energy performance and achieve energy savings. Additionally, it sets the framework for the establishment of the ESCO market in Greece through Energy Performance Contracts, this way promoting also the use of domestic RES systems.
- "Energy Inspectors of buildings, boilers and heating and air conditioning" (P.D.100/2010).
- "Financing Environmental Interventions, Green Fund, Ratification forests maps and other provisions" (L.3889/2010).
- "ESCOs - Functioning, Registry, Code of conduct and related provisions" (MD D6/13280/ 07.06.2011).
- "Framework methodology for measuring and verifying energy savings to achieve the national indicative energy savings target in the final consumption - eligible list of indicative measures to improve energy efficiency" (MD D6/7094/23.6.2011).
- Draft Law **"Energy Performance of buildings"**[3] - The provisions of this Act, harmonize the Greek legislation to the EU Directive 2010/31/EU "For the energy performance of buildings (recast)" (OJ L153 of 18.06.2010).

Moreover, and in accordance with the Income Tax Code (as amended by Act 3943/2011 – Government Gazette Series I, No 66 of 2011), provision is made for the deduction of expenses from taxable income of 20% of expenditure for amounts of up to 3,000 euros and of 10% of expenditure for amounts of between 3,001 and 6,000 euros, for energy upgrading

[3] http://www.opengov.gr/minenv/?p=4452

interventions which are included in projects under the O.P. "Environment – Sustainable Development" in the framework of the NRSF or for energy upgrading interventions on property, which may be required following an energy inspection.

Also, as an “urban incentive”, and in accordance with the General Building Rules, for buildings with a maximum height of 8.50 metres and for bioclimatic buildings regardless of height, an additional increase in the authorised volume coefficient is given, if an energy study provides for such need. It must be further mentioned that, currently, energy efficient renewable energy technologies in buildings are promoted under:

- The tax deduction scheme, set by L. 3522/2006, which considers all small domestic RES systems to be eligible for a 20% tax deduction capped at € 700 per system.
- The requirements of the programme for development of PV on building roofs (JMD OG. B1079/4.6.2009), whereas in order to be eligible for a very favourable Feed-in-Tariff (FIT), a residence has to cover part of its hot water needs by some other renewable source (e.g. solar thermal).
- The national Programme “Energy Efficiency at Household Buildings”, through subsidies of the installation of RES and energy conservation measures in residential buildings.

4.1.3 Planned activities in relation to the implementation of the EPBD recast and the RESD

Emphasis has been given in measures that concern the building (residential and tertiary) and transport sectors, as these present the greatest increase in final energy consumption and the average annual increase in energy consumption over the period 1990 to 2007 amounts to 2.4%, 3.4% and 6.8% respectively, so they have high potential for energy savings. Emphasis is/was put on developing the appropriate structures (records, databases, technical guides), necessary for implementing the regulatory framework developed and measuring the achieved savings, as well as on public consultation with market players, with a view to ensure that this regulatory framework is widely accepted.

Two major programs give economic incentives for improving energy efficiency in the residential sector:

- The program “Changing Air-Conditioner” for replacement of old split air-conditioning units run on summer 2009 and led to the replacement of more than 140,000 units all over Greece;
- The “Energy Efficiency at Household Buildings” program for the insulation of walls and roofs, the replacement of windows/doors (frames/glazing), and the upgrading of heating and hot water supply equipment. This co-financed Program concerns buildings which have a building permit or other legalization document, are located in areas with an average zone price lower than or equal to 2,100 €/m^2, are used as a residence, their owners meet specific income-related criteria and are classified as low energy efficiency buildings. The Program offers citizens incentives to carry out the most important interventions, aimed at improving their houses’ energy efficiency, while at the same time contributes to the achievement of Greece’s energy and environmental targets; once completed, the Program will have helped to save energy up to 1 billion kWh annually.

The Ministry of Development (former) in 2009 issued a program named “EXIKONOMO” (which means “Let's save Energy”) for municipalities with more than 10,000 citizens. This program aims in the application of actions and proven good practices for the reduction of energy consumption in urban environments, laying stress on building sector (municipal buildings) and upgrade of communal areas and secondarily in the sector of municipal and private transfers and energy consuming municipal premises, through the implementation of

technical interventions and actions for the sensitization and mobilization of citizens, local government, companies and entities.

There are also Programmes for improving the energy efficiency of public buildings under Priority Axis 1 "Protection of the Atmospheric Environment & Urban Transport – Tackling Climate Change – RES" of the O.P. "Environment and Sustainable Development". In particular, the following funding actions have already been promoted:

- Installation of high-efficiency CHP units in conjunction with natural gas cooling systems in hospitals, with a budget of €15,000,000; this action is ongoing and so far three applications have been filed.
- Demonstration projects for the use of RES and energy-saving measures in existing public primary and secondary school buildings, with a budget of €40,000,000; this action is ongoing and so far ten applications have been filed.
- Standard demonstration projects for the use of RES and energy saving in public buildings, with a budget of €40,000,000; for this action, 63 applications have been submitted with a budget of €120,000,000, and are currently in the evaluation phase.
- The demonstration project entitled "Green Neighbourhood", with a budget of €7,000,000, involving an energy upgrade of four residential apartment blocks in buildings with almost zero energy consumption, and the optimisation of the local micro-climate; the project is in the implementation phase, involving the incorporation of modern energy-saving technology and RES to achieve maximum possible benefit at minimum cost.

Finally, a very ambitious programme to improve the energy efficiency of the building stock of Greece, the "Building the Future", has been initiated by the MEECC. In the framework of this programme, which started in 2011 and will last until 2020, there will be 3,100,000 energy interventions in buildings (houses, apartments, commercial buildings), while the benefit of savings for citizens will be €9 billion. These resources will both allow the country to achieve its goals of 20% energy saving by 2020 and offer a driving force for further refinement and development of the sector of building construction, materials and energy products.

The main idea behind the programme is that the companies selling construction materials and related goods can voluntarily offer discounts to property owners carrying out EE upgrades of their homes and business premises. MEECC is also pressing ahead with procedures for implementing greater tax relief for this form of investment through certificates to be submitted along with one's tax statement and issued by CRES, which has both the technical and economic administration of the programme. The "Building the Future" programme is not based on income criteria but in order of priority.

In the “integration of advanced and mature technology actions” level of the Programme (the other 2 levels being: “demonstration & pilot actions” and “actions for coordinated industrial & academic research”) incentives are given for seven categories of home improvement for residences and five in other types of buildings (in the period 2011-2012). Among these are:

1. Replacement of windows and doors with higher specification types in 20,000 dwellings;
2. Replacement of single- with double-glazing in 25,000 dwellings;
3. Installation of 5,000 solar panels;
4. Installation of 'cool' roofs on 20,000 dwellings;
5. Insulation of roofs for 20,000 dwellings, and insulation of facades in 20,000 dwellings;
6. Replacement of 20,000 conventional heating systems with new high-efficiency systems.

Envisaged works on commercial and other buildings include:

1. Instalment of integrated facades (windows, double-glazing, shading systems) on 3,000 commercial buildings;

2. External insulation on 5,000 buildings;
3. Installation of high-efficiency cooling-heating-ventilation systems on 5,000 commercial buildings;
4. Replacement of artificial lighting systems in 10,000 commercial buildings;
5. Installation of advanced energy monitoring systems in 1,000 commercial buildings.

4.2 National policies and strategies in the field of continuing vocational education and training (VET)

4.2.1 The national policy and strategy related to green skills and jobs

In Greece, the debate on “green growth” (hence the "green economy", "green business", "green energy", "green jobs" and "green jobs/professions") essentially began in 2009, in the midst of economic crisis. The government that emerged from the elections of 2009 included green growth on top priorities as a new strategy to exit the crisis by seeking socioeconomic reconstruction of the productive base of the country, the balanced regional development, the creation of new jobs, whilst investing in education, knowledge, innovation and new technologies. The emergence of this new development model opens new possibilities for the rural tourism sector by creating new opportunities in the manufacturing sector, the construction and the energy sector.

The priorities are: the climate and energy, the restructuring of the productive sectors and the conservation of natural resources, which are associated with the activity of the Ministry of Environment, Energy and Climate Change (Ministry of Environment), created at the time. Indeed, the Ministry of Environment prepared a Program of Development Interventions for the period 2010 to 2015 on the implementation of a sustainable response to the challenges faced by the country both in environmental, energy and spatial level and at a level of ensuring long-term economic growth and exit from the economic crisis, setting a solid foundation for future generations.

The key features of the development interventions programme are the following[4]:

- Attracting and implementation of investments for development with a total budget of 44.4€ billion by 2015.
- Creation of over 210,000 new jobs, of which 27,000 correspond to permanent employment staff.
- Stimulation of the economic activity in some of the most important sectors of the Greek economy, such as the construction industry, the facilities and equipment manufacturing, the financial services, services and projects and all types of communication.
- Transfer of considerable expertise through the creation of new industries, new skills and new products.
- Utilization of skilled manpower in the country with the upgrade of existing skills in a way to ensure competitive conditions worldwide.
- Keeping down rising unemployment and obtaining an additional financial benefit by reducing costs in unemployment benefits and employment incentives, increasing contributions to the insurance industry and stimulate demand by creating new incomes.
- Exploitation of the potential in the private sector to ensure the objectives of the program.

The **basic pillars** of the program of development interventions are:

[4] «Development Interventions’ Programme for the Real Economy», MEECC, July 2010.

1. ***Facing climate change by switching to a competitive economy of low carbon consumption***: It incorporates a range of policies that focus on improving energy efficiency, increasing the country's energy potential in renewable energy and natural gas, ensuring energy supply, providing reliable energy products and services to consumers and promoting environmentally friendly consumption and production patterns through the "Green Supplies". The total budget of the investments included in this pillar is 31.8€ billion and it is expected to create over 169,000 jobs.
2. ***Sustainable management and protection of natural resources***: It collects actions aimed at the protection and the enhancement of biodiversity, management and protection of water resources and forests, as well as the planning for the prompt response to environmental risks and crises, through the implementation of development investments in technical works and projects for the exploitation of natural resources as well as the restoration of natural landscapes. The total budget of investments included under Pillar 2 is 2.3€ billion and it is expected to create over 11,000 jobs.
3. ***Upgrading of the quality of life, respecting the environment***: It comprises a range of large urban regeneration interventions both in the capital and in the regions as well as significant actions for the improvement of the urban environment such as noise and pollution reduction and the development of sustainable mobility. Significant investments in recycling and waste management are also promoted. The budget investments included under the specific pillar is around 9.5€ billion and it is expected to create ~27,000 jobs.
4. ***Strengthening of the mechanisms and institutions of environmental governance***: It aims at strengthening the environmental governance through a set of actions which are key pillars to strengthen the institutions and the mechanisms of environmental governance, including institutional interventions as well as investments for their enhancement in material and human resources. The total budget of investments included under the particular pillar is 846.7€ million and it is expected to create up to 2,400 jobs.

Moreover, by Law 3889/2010 "Financing Environmental Interventions, Green Fund, Ratification of forest maps and other provisions", the "Special Fund for the Implementation of Regulatory Planning and Design" (ETERPS) was renamed as "Green Fund" with the aim of establishing an integrated financing system of environmental interventions. The indicative shafts operations to fund the Green Fund are biodiversity, forests, protecting water - land, facing serious environmental problems, prevention, protection and regulation of spatial planning, urban revitalization, enhancement of RES, saving energy etc.

Finally, it is worth mentioning that in the framework of the O.P. "Human Resources Development 2007-2013" of the Ministry of Labour and Social Security, a program has been launched to train unemployed people in certified Vocational Training Centres (VTC) through their mandatory employment in green occupations. This program includes 293 CVT courses to be implemented in Greece and 7,500 unemployed people are expected to benefit. It is about vocational training programs in "green economy" jobs related to the production or services of environmentally friendly products. The training will be linked with the practice of the trainees in the field of green development in partner companies, including a compulsory employment of 30% of the trainees in jobs related to the training subject. The projects will be implemented gradually at regional level from October 2011 until the end of 2013. Further relevant information on this programme is provided in Chapter 6 of the Report.

4.2.2 National implementation of EQF and other EU education and training policies in the building sector

With regard to the policies in the field of Lifelong Learning it should be noted that on the 6th of July 2005, it was published in the Greek Government Gazette 171/t.A including the 3369 Law on the systematization of lifelong learning and training. On December 30th of that year, the

Ministerial Decision No. 113708 (OG B 1914 / 12.30.2005) was issued, concerning the system of certification programs, knowledge, skills and abilities. On September 21st, 2010 the guidelines for the development of lifelong learning were finalized with the publication of the 3879 Act (Greek Government Gazette 163/t.A.). This law regulates the issues related to lifelong learning beyond the formal educational system as well as the actions of the organizations of the formal educational system.

The most important step, however, is the creation of a coherent national framework for the evaluation and the certification for all types of training and adult education with the creation of the National Organization for the Certification of Qualifications (EOPP). Subsequently, the EOPP merged with the National Organisation for Vocational Guidance (EKEP) and the National Accreditation Centre for Lifelong Learning providers (EKEPIS) into a single organization, the National Organization for the Certification of Qualifications and Vocational Guidance (EOPPEP) under the supervision of the Ministry of Education & Religious Affairs, Culture & Sports based on the CMD 119959/H (OG 2351/20-10-2011). The new consolidated organization incorporates all the objects and eligibility of the three bodies merged. The certification of the job profiles has already been published on May 8th, 2006, with the Greek Government Gazette 566/t.V.

The results of the certification system are the following direct and indirect long-term objectives:

Direct objectives:

- The development of a relationship of complementarily synchronization and upgrade of the skills acquired through initial and continuing vocational training.
- The development of a common methodology for the creation of curricula taking into account the methodologies used by the initial and the continuing training and transformation of curricula of initial and continuing vocational training in the form of units and modules.
- The implementation of systems of credits in initial and continuing vocational training and the assignment of projects with European levels of education and professional qualifications.

Indirect objectives:

- The establishment of a national list of certified professional profiles.
- The possibility of recognition of alternative ways for acquiring professional qualifications.
- The recognition ability of the outputs of the two systems of education and training.
- The acceptance by the labour market of the qualifications acquired through the system of lifelong learning.
- The direct connection of the content of the vocational education and training programs with their respective job profiles.
- The establishment of methods, specifications and criteria for the development, evaluation and certification of professional profiles.
- The enhancement of the validity of vocational training and its closer connection to the labour market needs.
- The improvement of the professional skills of the country's human resources as well as the facilitation of the integration of the unemployed and the socially vulnerable people into employment.

- The strengthening of the role of social partners in the system of lifelong vocational training.
- The ensuring of the quality and the effectiveness of the programs implemented in the context of lifelong vocational education and training.

EOPPEP has undertaken the establishment of the recognition and certification system of qualifications, skills and abilities in a way that ensures the quality and mutual trust between the social partners. The National Qualifications Framework – i.e. the Hellenic Qualifications Framework (HQF)[5] - is also established in correspondence with the European "EQF" with 8 reference levels of learning process.

National Qualifications Framework (NQF)

In the methodological guide for the development of the National Qualifications Framework, four (4) consecutive phases are provided (see figure below). The first and the second phase have already been completed while on the 17th of February 2011 the Ministry of Education and Religious Affairs, Culture & Sports – in a press release - announced that it moves on to the third stage of the development of the National Qualifications Framework: the initiation of the matching process in the 8 levels of the NQF with specific descriptors for qualifications awarded by institutions of formal education (Secondary and Higher). The 3rd phase is the most important one for the NQF and it will result in the legal consolidation of the qualifications certification system and the bodies' accreditation and qualifications system.

It is important to note that the National Qualifications Framework does not categorize people, but learning outcomes and career paths. This matching is provided by decisions taken by the European Parliament. Each country must adjust the qualifications awarded nationally in eight levels of the European Qualifications Framework (EQF) via national qualifications frameworks. This does not mean that the NQF should necessarily have eight levels (for example Ireland has ten levels, while Scotland twelve).

Figure 4.1: HQF development phases

Currently, the HQF is at the final stage of its development which is the referencing to the EQF. The transition state followed a 4 stages plan. According to the HQF website[6], the implementation of the 4th phase ("Referencing to the EQF") was expected to be completed by end of 2012. By the time of finalising this report, the outcomes of this phase had not been yet published.

The National Qualifications Framework in its final form enhances the mobility and the career advancement opportunities of the employees provided that their qualifications are recognized at a national and a European level. It also promotes transparency in qualifications and supports in a better way the relationship between education and training to the labour market needs. With the implementation of the NQF, there is great potential for the identification and certification of the professional experience of citizens, by adopting forms of practical

[5] http://en.nqf.gov.gr/Home/TheHellenicQualificationsFramework/tabid/103/Default.aspx
[6] http://en.nqf.gov.gr/DevelopmentPhases/tabid/162/Default.aspx

recognition of informal learning that have been tested in other countries (e.g. credit system, etc.).

The HQF comprises of 8 levels covering all types of qualifications from compulsory to higher education (Table 4.3). It facilitates the validation of non-formally (ex. initial and continuing vocational training) and informally (i.e. vocational experience) acquired qualifications. The learning outcomes that correspond to the qualifications of a specific level are defined through a set of descriptors which are based on a classification of quality and quantity of knowledge, skills and competences. The 8 reference levels of the European Qualifications Framework that are defined from the learning outcomes and coincide with the HQF are presented in a Table in Annex I.

Table 4.3: The 8 levels of the Hellenic Qualifications Framework

LEVEL	DESCRIPTION
1	Related to the possibility of continuing to the 2nd level of Secondary Education
2	Related to the possibility of completing the 2nd level of Secondary Education and/or attending a continuing vocational training programme.
3	Related the completion of the 2nd level of Secondary Education and also refers to qualifications that are acquired through vocational experience.
4	Related to the completion of at least the 2nd level of Secondary Education, which has been upgraded through further education and training or working experience.
5	Related to the completion of a Post-Secondary Education and Training Programme, or the "swift cycle" of an Education and Training Programme.
6	Related to the qualifications acquired through the 1st level of Higher Education.
7	Related to the qualifications acquired through the 2nd level of Higher education.
8	Related to the qualifications acquired through the 3rd level of Higher Education.

Finally, it should be noted that training and certification of occupations programs have not yet started in Greece as referred in the European Directive 2009/28/EC of 23rd of April 2009 concerning the promotion of energy use from renewable sources. Also, it is not yet determined which certification system or an equivalent one will be followed for this installers' category.

5. Statistics on building and energy sectors

5.1 Introduction

According to the Hellenic Statistical Authority's latest published Census, conducted at 2001, Greece had a population of 10,787,690, 3,664,392 households, and a building stock of 3,990,970 (49% in urban areas). 77% of the buildings are residential, 52% of them in urban areas.

There was no specific regulation as concerns the assessment of energy performance and certification of buildings before the law N.3661/2008, which consist the harmonization of the national legislation to the EPBD in Greece. The majority of the buildings - ~65% - was constructed before 1980, when the Thermal Insulation Regulation has been put in force, and they are lacking thermal insulation, have a low energy efficiency and, in parallel, old electrical and/or mechanical installations.

Constructions have been one of the most important sectors of the Greek economy; during the period of 2000-2004 the sector contributed to the Gross Domestic Product (GDP) by approximately 7%, and more than 8% to the total employment (figure 5.1 presents the contribution of the construction industry in GDP during the period 2002-2010). As Greece is going through the economic and social crisis, several sectors which met huge development in the past decades are now facing significant problems. The constructions sector has gone from bloom to gloom over the last twelve years:[7]

- during 2000 - 2006 a continuous increase has benefit the constructions sector, with a maximum value of 8.8% contribution to the Greek GDP at the fourth quarter of 2006,
- since the fourth quarter of 2006 a rapid and continuous decline is observed, reaching 3.75% of the GDP in the first quarter of 2012.

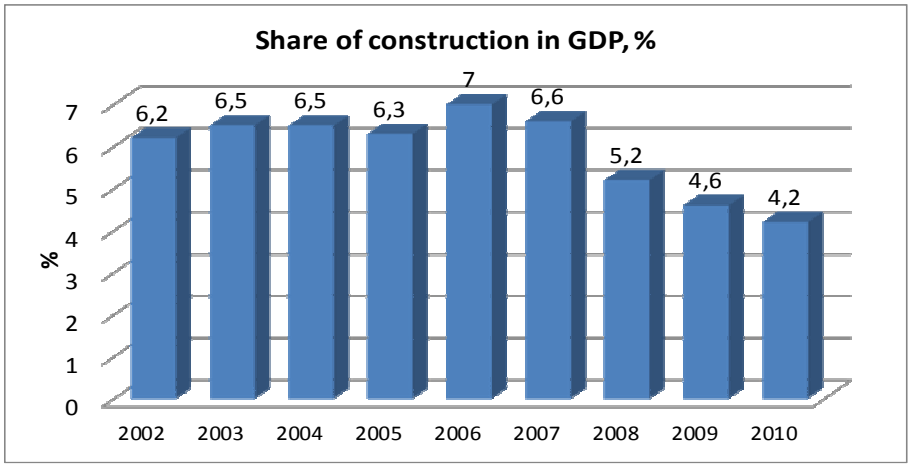


Figure 5.1: Contribution of the constructions sector to GDP[8]

As concerns the employment, during the period of 2008-2011 157,000 jobs were cut in the construction industry, 150% more than the ones created for an entire decade (1998 - 2008). Constructions met the greater impact in employment than any other sector of the Greek economy. In particular, the 295,000 employees in the construction industry in 1998,

[7] Association of Greek Contracting Companies, "Developments in the Greek Construction Sector" A|2012, Biannual Progress Report, Issue No. 7 - October 2012

[8] *UNECE*, http://w3.unece.org/pxweb/quickstatistics/readtimeseriesFlash.asp?qs_id=8&c_id=300, Eurostat

increased to 402,000 by 2008, to fall at 213,500 during the second quarter of 2012[9], leading to a cumulative loss of 188,500 jobs.

5.2 Statistics on the building stock

5.2.1 Building stock characteristics (type of buildings, annual rate of new construction and renovation)

Table 5.1 summarises the number of built-properties as recorded in the most recent Buildings Census conducted in December 2000. The Buildings Census is conducted every ten years and covers all buildings existing in the country on the 1st December 2000, irrespective of their use, e.g. residential buildings (dwellings), stores, offices, factories, etc.).

The Greek buildings age is illustrated in table 5.1 and figure 5.2 below, from which it is derived that 5% of the buildings have been constructed before 1919, 64.4% between 1919 and 1980, and only the 30.6% of them have been built after 1980.

Table 5.1: Buildings, per period of construction[10]

Period of Construction (Total No of Buildings: 3,990,970)										
Before 1919	1919-45	1946-60	1961-70	1971-80	1981-85	1986-90	1991-95	1996-2000	buildings under construction	N/A
199,510	406,633	665,315	761,182	737,575	404,303	297,348	241,615	191,739	57,430	28,320

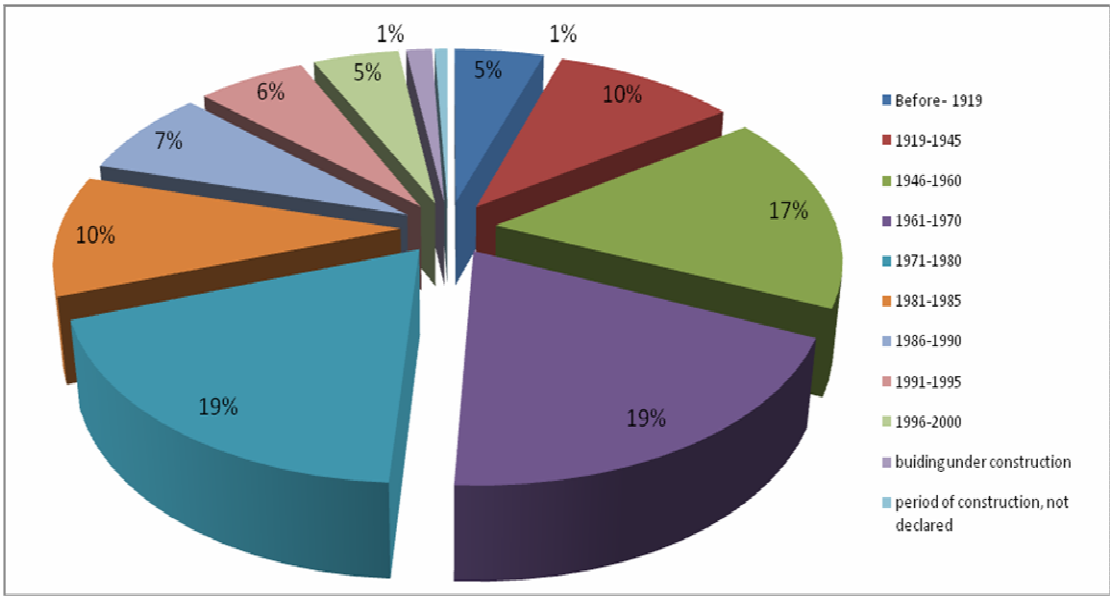


Figure 5.2: Buildings, per period of construction, Buildings Census 2000

58% are ground floor buildings, and 30% have an additional floor; less than 1% of the buildings have more than 6 floors.

[9] www.grreporter.info/en/157_000_jobs_construction_industry_were_cut_within_three_years/6122
[10] Hellenic Statistical Authority, http://www.statistics.gr/portal/page/portal/ESYE/PAGE-themes?p_param=A1302

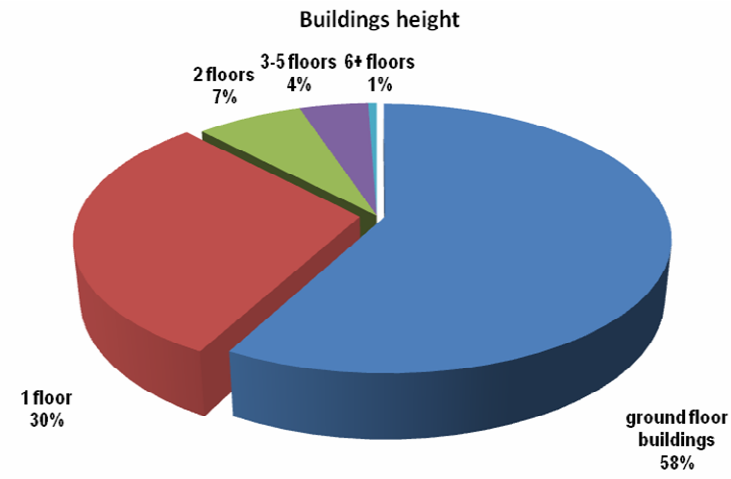


Figure 5.3: Buildings height

The distribution of buildings according to their exclusive use is presented in Table 5.2. More than 77% (figure 5.4) of the buildings recorded are residential buildings; thus residential buildings are the main target of national policies for energy saving.

Table 5.2: Exclusive use of the existing buildings[10]

Residential buildings	Churches – monasteries	Hotels	Plants, factories – workshops	School buildings	Shops – offices	Car stations	Hospitals – clinics	Other
2,755,570	43,463	22,830	31,422	16,804	111,097	510	1,961	593,698

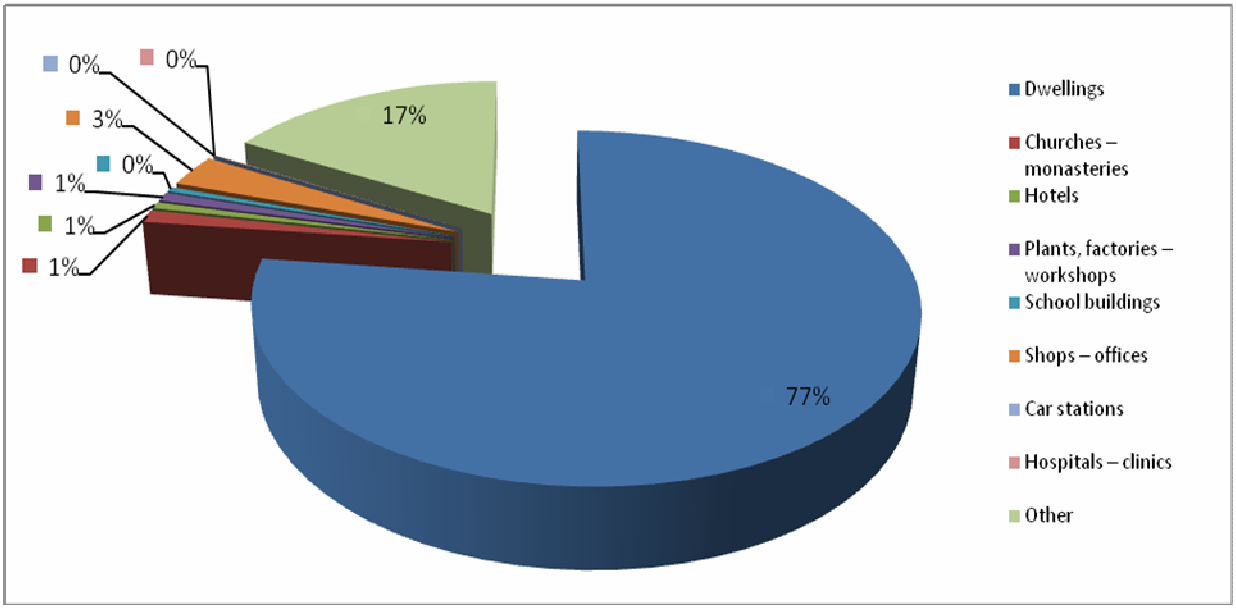


Figure 5.4: Use of the existing building stock, Buildings Census 2000

The total surface of Greek dwellings is estimated to 450 million m^2. 60% of the dwellings are apartments or flats, 39% are recorded as detached or semi detached houses. 23% are rented and 71% are owned (but 12% under mortgage).[11]

[11] Hellenic Statistical Authority, Living Conditions in Greece, 2 November 2012

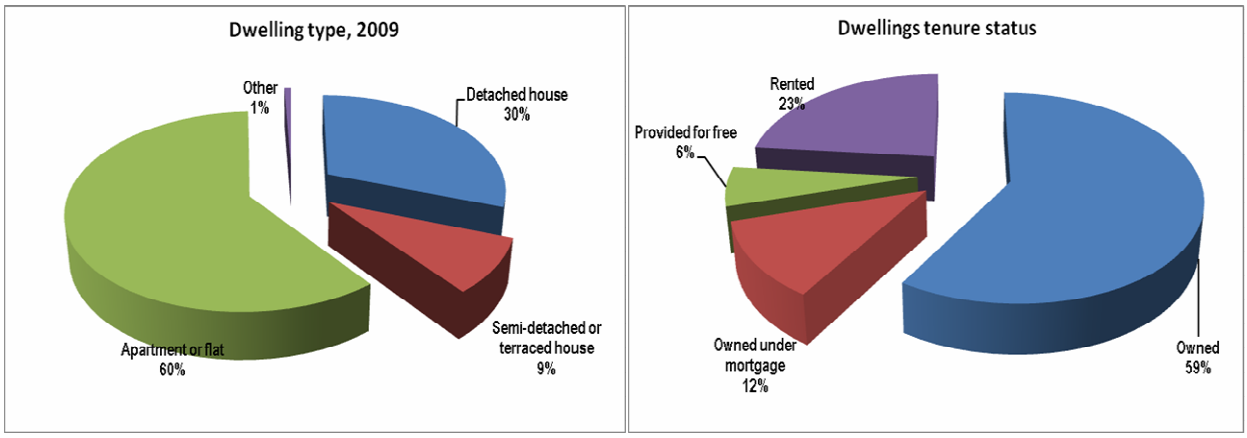


Figure 5.5: Distribution of households by dwelling type and tenure status

As concerns the size of the houses, 58% of them are 50-99 m^2, 10% below 49 m^2, and 32% above 100 m^2.

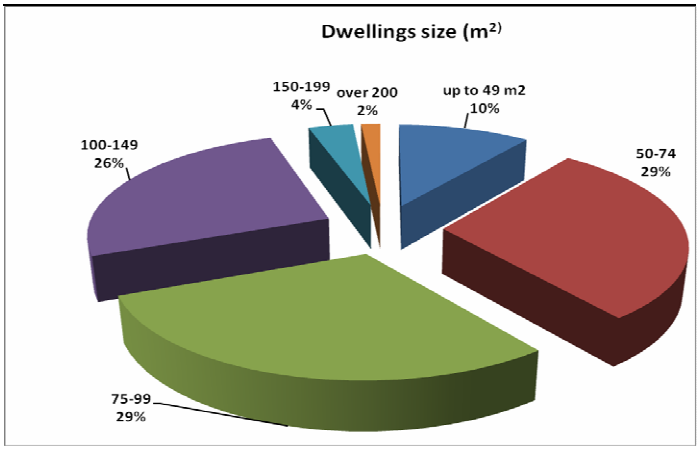


Figure 5.6: Dwellings size, Population Census 2001

The main building materials are concrete and bricks; concrete is used in approximately 48% of the buildings, while in 22% the main material is stone. Almost 42% of the buildings have a terrace and 58% a pitched roof (figure 5.7). The vast majority of the buildings have a pitched roof, and the main overlay material is tiles (82%).

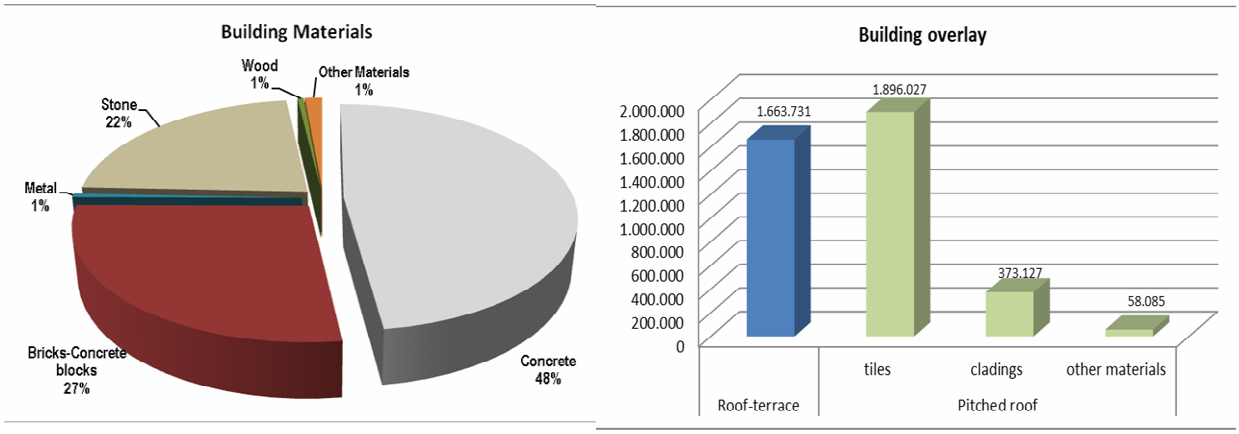


Figure 5.7: Main building materials, Buildings Census 2000[12]

[12] Hellenic Statistical Authority, http://www.statistics.gr

A more recent Buildings Census was conducted in 2010 but the results are not yet available; the data processing is expected to be finalised by the end of 2013. New built properties are monthly recorded by the Hellenic Statistical Authority and the issued building permits are presented in the following table and graph.

Table 5.3: New built properties*- Number of issued building permits (2000-2011)[13]

Year	Number	Storeys	Volume (m^3)	Surface (m^2)
2000	35,200	70,983	50,389,208	13,976,780
2001	40,448	83,450	57,981,269	16,269,724
2002	45,195	94,660	64,995,536	18,969,174
2003	45,253	95,173	65,694,798	18,361,774
2004	43,447	90,336	61,979,467	17,294,032
2005	56,342	132,359	88,775,762	25,876,755
2006	45,406	96,246	67,153,393	18,494,123
2007	41,790	84,023	62,825,628	16,910,545
2008	34,021	65,489	51,859,356	13,664,965
2009	27,447	51,987	35,823,008	9,833,690
2010	23,380	43,605	27,823,083	7,987,904
2011	15,114	26,156	16,411,950	4,464,072

** Built - property: a building or a suit of buildings or improvised structures situated on the same site, which has access to a street and may be owned by one or more persons (e.g. a block of houses),*

The decline of the number of built properties permits, for the period 2008-2011 is rather high following to the financial crisis. The building activity has been growing from 2000-2005, to have a continuous decline from 2006 to 2011 (-20% as an average annual decrease of the building permits issued). In 2012, the total Building Activity (private and public building permits) has faced further reduction of 25.0% for the January-July period, compared to the same period of 2011.

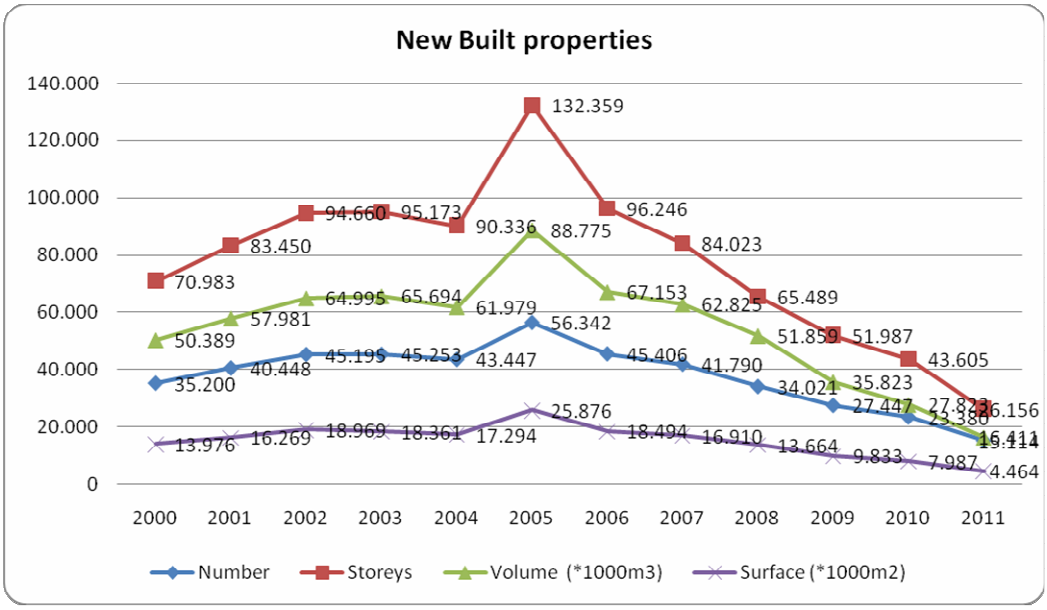


Figure 5.8: New built – properties permits (2000-2011)

[13] Hellenic Statistical Authority, http://www.statistics.gr

The building permits issued for new constructions for residential use, during the period 2000-2011, are presented in Table 5.4 and Figure 5.9. Since 2006 a significant decline has been recorded (of an average annual rate of -26%) and new residential buildings' permits were decreased by 43% from 2010 to 2011.

Table 5.4: New residential buildings issued permits (2000-2011)[14]

Year	Number	Inhabitable Rooms	Volume (m³)
2000	89,389	283,676	35,750,454
2001	108,021	335,638	42,431,378
2002	128,296	385,529	48,602,809
2003	127,051	374,900	47,696,251
2004	122,163	360,662	45,593,191
2005	195,207	568,918	71,674,619
2006	125,387	373,588	48,205,006
2007	103,865	314,539	40,897,049
2008	79,601	240,846	31,256,456
2009	61,490	186,526	24,893,720
2010	52,344	160,169	20,666,895
2011	29,974	91,008	12,232,461

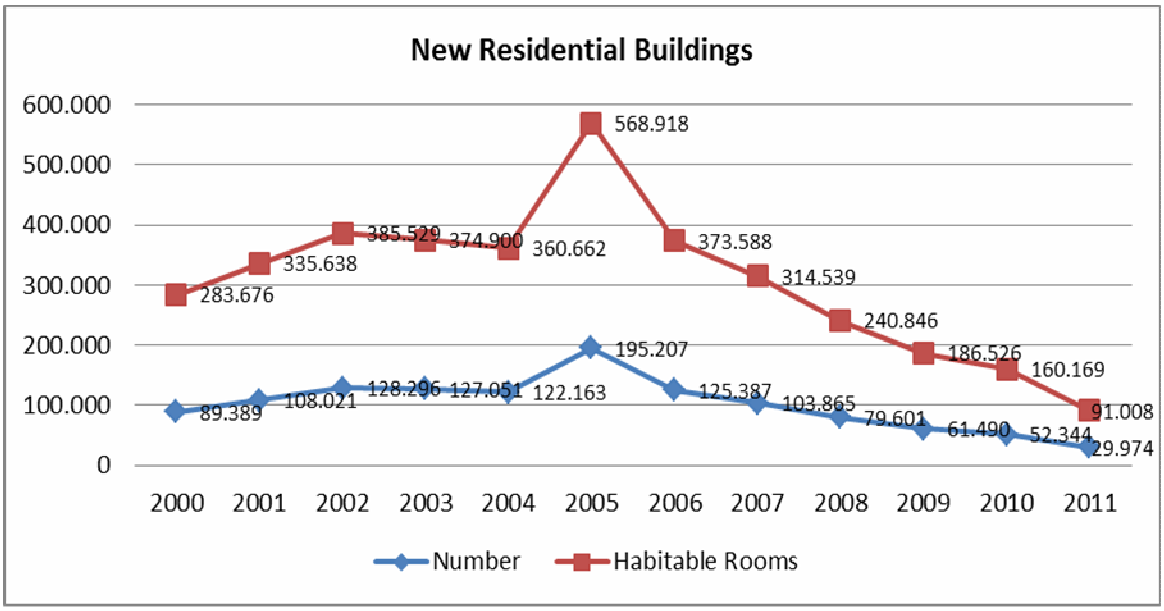


Figure 5.9: New residential buildings permits (2000-2011)

The building permits recession continued during 2012. More precisely, in the 1st semester of 2012 a decrease of 16% was recorded compared to the same period in 2011. The non-residential new buildings (i.e. commercial, industrial, agricultural, offices, et al.) based on permits issued are illustrated in Tables 5.5 and 5.6; recession became more deep since 2008 (see Table 5.5).

[14] Hellenic Statistical Authority, http://www.statistics.gr/portal/page/portal/ESYE/PAGE-themes?p_param=A1302

Table 5.5: New buildings for non-residential use (2000-2011)[15]

Year	Number	Volume (m³)
2000	13,333	26,289,718
2001	14,400	27,614,188
2002	15,113	27,747,782
2003	14,974	29,611,356
2004	14,884	28,373,015
2005	18,409	29,998,065
2006	16,464	33,906,183
2007	16,393	36,198,002
2008	13,835	32,699,942
2009	10,857	22,131,213
2010	8,949	15,176,126

In Table 5.6 the non-residential buildings permits are recorded by their use. Commercial buildings represent the highest percentage followed by the industrials.

Table 5.6: Non-residential buildings permits (2006-2010)[15]

	2006	2007	2008	2009	2010
Type of activity	Number / Volume (m³)	Number / Volume (m³)	Number / Volume (m³)	Number / Volume (m³)	Number / Volume (m³)
Industrial	1,886 / 13,020,302	2,057 / 14,939,394	1,643 / 11,972,123	1,019 / 8,150,112	825 / 4,498,483
Agricultural	342 / 961,432	464 / 1,334,594	411 / 1,310,785	228 / 743,869	144 / 441,408
Offices	1,464 / 1,478,384	1,699 / 1,960,886	1,292 / 1,423,866	943 / 954,187	871 / 877,780
Educational	110 / 223,697	120 / 222,756	87 / 187,210	110 / 225,434	67 / 209,951
Commercial	5,527 / 6,703,737	5,024 / 6,552,076	3,986 / 6,120,398	3,560 / 4,532,583	2,772 / 3,122,989
Livestock	366 / 1,112,855	479 / 1,459,633	582 / 1,567,251	320 / 929,142	133 / 473,813
Hotels	659 / 2,506,484	650 / 2,676,284	506 / 2,476,477	369 / 1,519,401	308 / 122,993
Care centres	50 / 383,004	64 / 206,362	72 / 486,870	75 / 173,689	14 / 29,168
Other activities	2,016 / 3,560,855	2,095 / 3,125,157	1,865 / 3,768,349	1,543 / 2,027,790	308 / 1,229,933
Unidentified	4,044 / 3,955,433	3,741 / 3,720,860	3,391 / 3,386,613	2,690 / 2,875,006	2,215 / 2,395,518
TOTAL	**16,464 / 33,906,183**	**16,393 / 36,198,002**	**13,835 / 32,699,942**	**10,857 / 22,131,213**	**8,949 / 15,176,126**

The recession in the buildings sector due to the crisis, during the period 2007-2010, is high at all different types of buildings.

[15] Hellenic Statistical Authority, http://www.statistics.gr/portal/page/portal/ESYE/PAGE-themes?p_param=A1302

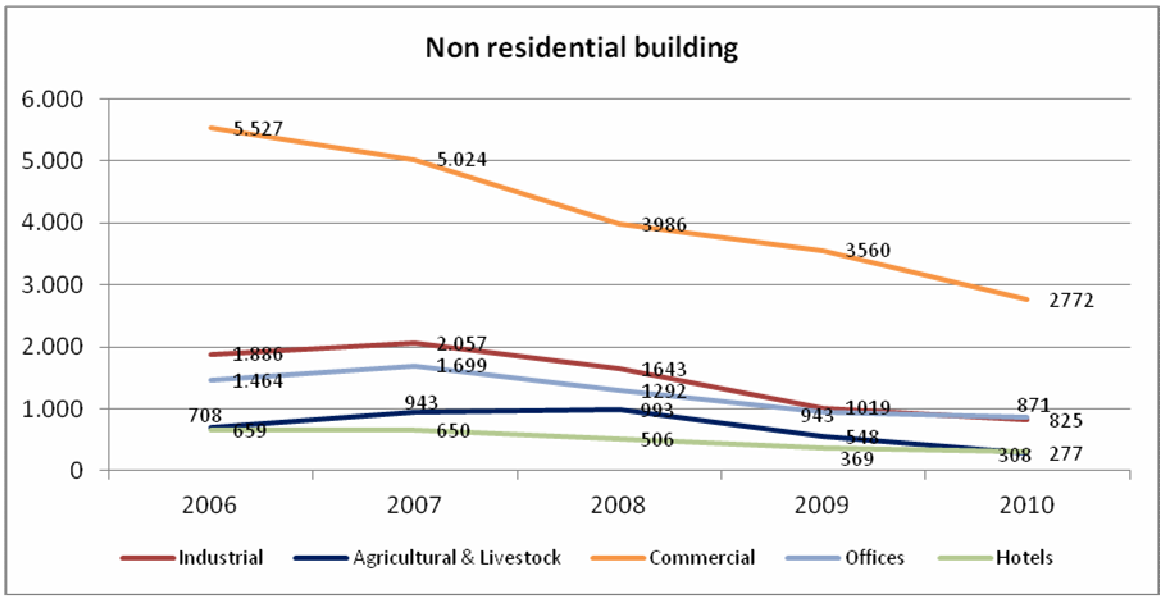


Figure 5.10: Non-residential buildings permits (2006-2010)

In Table 5.7 the number of building permits as regards additions, repairs and renovations is presented. The decline of building works in the last six years is evident in these cases also. In total, 28,166 permits for repairs and only 1,120 permits for building renovations were issued during the period 2006-2011.

Table 5.7: Type of building permit 2006-2011[16], apart from new buildings

Year	Additions	Repairs	Renovations
2006	11,708	5,563	264
2007	10,950	4,897	232
2008	8,943	4,596	199
2009	7,833	4,661	199
2010	7,092	4,624	165
2011	4,837	3,825	61

5.2.2 Number of low energy buildings, annual rate of new construction of energy efficient buildings and energy efficient renovations

Nearly zero energy buildings are not yet officially recorded in Greece, The first certified passive house was built in Athens in the middle of 2012[17] and a second one was also built in Volos (Passive House: semidetached house masonry construction, 477 m², 3 units).[18] A number of other buildings have been also characterised as passive; however the total number is extremely low.

In May 2012 the Hellenic Passive House Institute was founded in order to promote in Greece and Eastern Mediterranean Area the Passive House (Passiv Haus) standard - a standard that has proved it can contribute substantially towards energy saving and environmental upgrade of buildings in the Greek territory.[19]

[16] Hellenic Statistical Authority, http://www.statistics.gr/portal/page/portal/ESYE/PAGE-themes?p_param=A1302
[17] www.buildnet.gr/default.asp?pid=222&catid=203&artid=4608
[18] www.passivhausprojekte.de/projekte.php?search=2
[19] http://launch.eipak.org

5.2.3 Measures and supporting mechanisms for improving buildings' energy efficiency

Energy efficient renovations in the residential sector

The programme "Exoikonomisi kat'oikon" (Energy Saving at Household Buildings) has been designed as an integrated energy saving intervention in the residential building sector, aiming mainly to reduce the energy needs of buildings and the emissions of pollutants adding to the green-house effect. Public interest was increased since March 2012, with an average number of applications for loans' pre-approval more than 1.500 per week since September. So far the number of applications is 79,126, of which about half have received pre-approval loan, while 13,687 of them (total budget of 126.4 M€) - have already benefited from this Program.[20] The applications and budget distribution per region are presented in Table 5.8.

Table 5.8: Number of applications approved for the "Exoikonomisi kat'oikon" programme[21]

Region	Number	Budget (%)	% per region
Peloponnesus	637	6,513,523	5%
Central Macedonia	3,032	25,553,517	21%
Thessaly	1,646	15,625,464	12%
Attica	2,381	20,185,247	16%
Eastern Macedonia & Thrace	952	9,291,792	7%
Central Greece	790	7,787,772	6%
Western Greece	834	8,220,990	7%
Epirus	755	7,496,480	6%
Northern Aegean	552	5,305,841	4%
Southern Aegean	276	2,636,694	2%
Crete	553	5,519,214	4%
Western Macedonia	1,076	10,199,797	8%
Ionian Islands	203	2,062,188	2%
TOTAL	**13,687**	**126,398,524**	**100%**

Energy efficient renovations for municipalities

The "Let's save energy" programme supports the implementation of measures and best practices for the reduction of energy consumption by Greek Municipalities. The call under the Greek Operational Programme 'Environment and Sustainable Development' has resulted to 191 applications, from which 106 have been positively evaluated (total budget 83.4 M€).[22] Other measures focusing on buildings, currently in force, are referred in paragraph 5.3.

5.2.4 Enterprises active in the building sector

According to the latest data of EUROSTAT, as regards the construction enterprises, the rapid growth in the sector in early 2000 was followed by stabilization after 2005 (Table 5.9). In Greece, most of the companies involved in the construction sector undertake building works; in practice, a construction company also activates in building works. The construction sector was benefited by an increasing annual growth during the 2004 Olympic Games leading to a huge increase in the number of construction companies. The growth was fostered by favourable developments in the sector of residences and the fall of mortgage rates. However, the year 2005 has been a recession year for the constructions.[23]

[20] www.taxheaven.gr/news/news/view/id/10903
[21] www.ypeka.gr/Default.aspx?tabid=785&sni[524]=2063&language=el-GR
[22] http://www.econews.gr/2011/07/05/exoikonomw-programma-aitiseis-dimwn/
[23] J. Pantouvakis, O. Manoliadis, *Evaluation of construction corporate performance in Greece using a restructured Du Pont Model*, Studies in Regional & Urban Planning, Issue 10, December 2007

Table 5.9: Number of enterprises in the constructions sector[24]

2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
82,173	82,173	98,918	103,898	107,37	110,422	109,031	108,830	N/A	112,952(p)

(p): provisional

Construction of public works in Greece may be undertaken by domestic enterprises registered in the Register of Contractors' Companies (MEEP) of the Ministry of Infrastructure, Transport and Networks. The different public works categories are the following:

- Roads - Bridges:
- *Building Construction*
- Piping - Dams
- Ports, Offshore Drilling
- *Electrical and Mechanical Works*
- Energy Related Works.

According to the Department of Registers of Technical Occupations[25], which belongs to the Directorate General of Quality Public Works Secretariat, the total number of technical companies registered in MEEP is currently about 7.000. The above companies are members of different associations related to the building sector. From these 866 are also members of the Association of Greek Contracting Companies (SATE)[26], and most of them are registered – among others - in the building construction category.

5.3 Statistics on the current workforce in the building sector

During the 3rd Quarter (Q3) of 2007, 402,000 people were employed in the construction sector, to reach the number of 241,800 at the Q3 2011, as a result of the continuous decline in the sector (Figure 5.11).

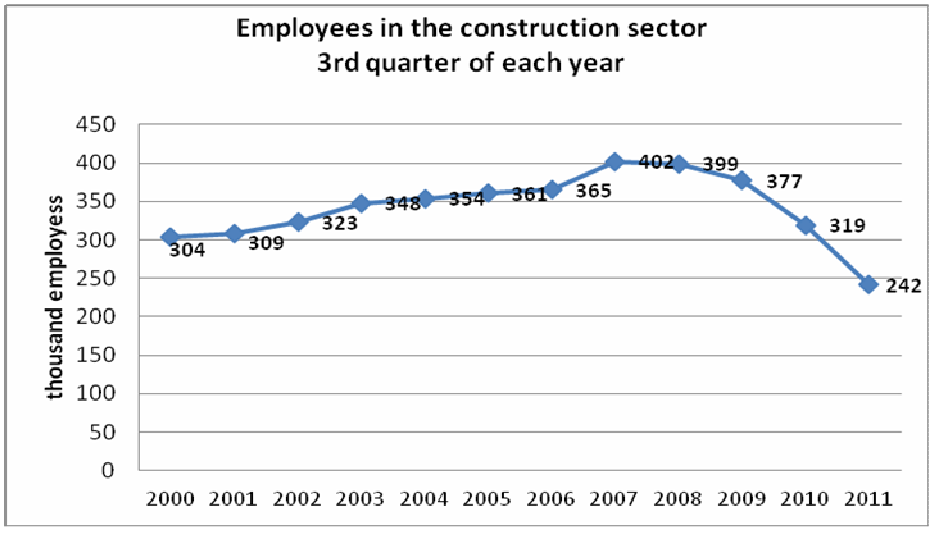


Figure 5.11: Employees in the construction sector[27]

[24] http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_4a_co&lang=en
[25] http://www.ypexd15.gr/
[26] Association of Greek Contracting Companies,Members List, 2012
[27] Association of Greek Contracting Companies, "Developments in the Greek Construction Sector" A|2012, Biannual Progress Report, Issue No. 7 - October 2012

Construction industry employed since 2003 over the 8% of the total workforce in Greece, reaching 9% in the third quarter in 2007. Since then, the sectors' employment is continuously shrinking. It reached its lowest point (5.6%) at least for the last 15 years.

Figure 5.12: Contribution of the construction sector to employment[27]

In the following table the number of employees in professional categories related to building constructions is presented for 2000, 2007 and 2008. The number of employees directly involved to the building construction sector increased from 2000 to 2007, and has met a significant decrease (almost -30%) during 2008.

Table 5.10: Number of employees in the main professions related to building constructions[28]

Trade	2000	2007	2008
Construction, completion of building and other construction works technicians	289,134	299,220	211,880
Metal moulders, welders, sheet-metal workers, structural-metal preparers, and related trades workers	2,334	2,535	3,011
Engineers, operators and maintainers of machinery, electrical and electronic equipment	3,607	4,670	7,587

The Hellenic Statistical Authority holds data for the 3 digits codes according to the national statistical classification of economic activities (STAKOD). Information was available for the relevant categories presented in Table 5.11.

Table 5.11: Employees in the building sector according to STAKOD[29]

Category according to STAKOD	2008 (4th quarter)	2009 (4th quarter)	2010 (4th quarter)	2011 (4th quarter)	2012 (2nd quarter)
412 Building constructions	141,957	123,420	97,946	72,741	67,051
432 Electrical, plumbing and other construction activities	73,109	77,333	65,772	45,517	39,986
433 Construction activities of building installation	115,538	106,138	85,868	64,899	57,823
439 Other specialized construction activities	2,755	5,228	3,925	1,559	1,964

[28] Opinion of OKE's Initiative, *The construction and building activities as components of economic development and the impact of economic recession on them.*
[29] Hellenic Statistical Authority

5.4 Statistics for energy consumption and renewable energy in buildings

5.4.1 Energy consumption in buildings

In 2010, the energy consumption in Greek buildings was 4.6 Mtoe against 3.1 Mtoe in 1990, namely a 48.6% total growth in households' energy consumption. Nevertheless, the most rapidly growing sector in terms of energy consumption has been the tertiary sector. Energy consumption of the tertiary sector has almost tripled since 1990, following an average growing trend of 6.7% per year. The energy consumption of industry and agriculture remains almost constant and near 1990 levels (figure 5.13).

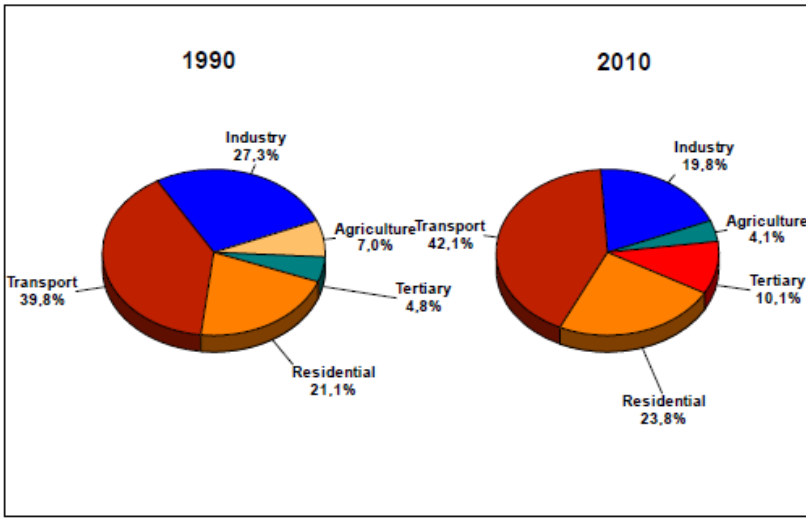


Figure 5.13: Final energy consumption in Greece[30]

However, in years 2008 and 2009, and even more in 2010, there was a reduction in consumption specifically in the industrial, residential and tertiary sectors, due to the fact that these sectors were the first to sustain the effects of the economic recession on the final energy consumption, which is further enhanced by the increase in energy prices. This decrease in consumption is particularly noticeable in the transport sector, where although there was an 8.1% increase in energy consumption in 2009 compared to 2008, the reduction of fuel consumption in the activities of the transport sector in 2010 was 11.5%, compared to 2009. Figure 5.14 presents the average annual energy consumption per unit area (kWh/m^2) and compares energy consumption between different building uses.

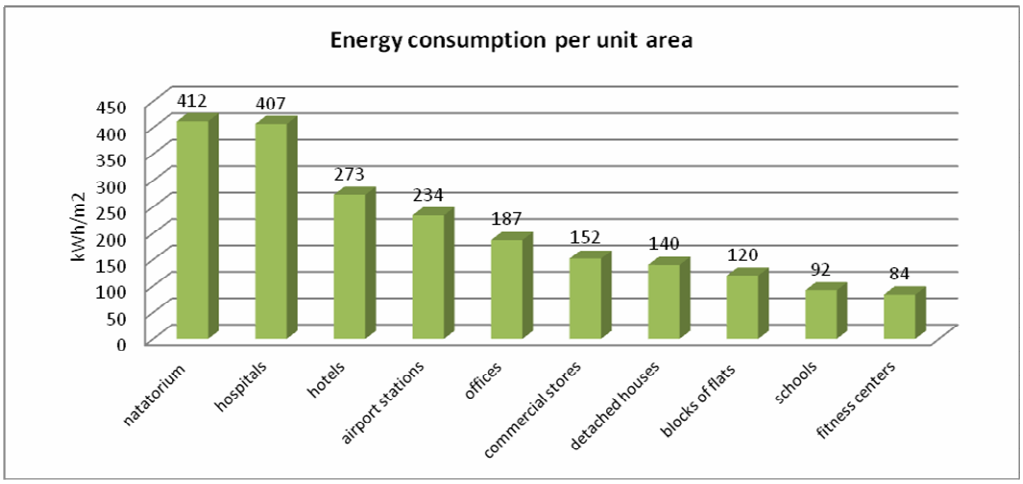


Figure 5.14: Average annual total final energy consumption of buildings per unit area (kWh/m^2)

[30] TOTEE / YPEKA 2011

The energy efficiency upgrade of existing buildings is the biggest challenge to meet the energy savings targets in the building sector, as the energy behaviour of the existing building stock will determine the future energy efficiency index of the building sector.[31] In a recent study of the MEECC, the energy consumption in the existing building stock per use (residential, offices-shops, hospitals, hotels and schools) was estimated for 4 Greek climate zones (see figure 5.15) and three typical construction periods as shown in Table 5.12.

Table 5.12: Average annual electrical and thermal energy consumption (kWh/m^2) in buildings for different climatic zones[32]

Climatic zones	Electrical energy consumption (kWh/m² a)			Thermal energy consumption (kWh/m² a)		
	1980	2001	2010	1980	2001	2010
Office/commercial (O/C)						
Greece (total)	**42**	**56**	**71**	**93**	**75**	**70**
Zone A	48	67	88	67	52	48
Zone B	43	57	72	85	69	65
Zone C	39	51	64	107	89	83
Zone D	36	48	63	134	110	103
Hotels (H)						
Greece (total)	**70**	**110**	**130**	**90**	**80**	**75**
Zone A	77	122	145	71	62	58
Zone B	66	104	123	90	78	73
Zone C	54	86	102	113	99	92
Zone D	46	73	87	142	124	115
Schools (S)						
Greece (total)	**20**	**20**	**21**	**32**	**31**	**31**
Zone A	23	23	24	24	23	23
Zone B	21	21	22	29	29	28
Zone C	18	19	20	37	36	36
Zone D	17	17	18	46	46	45
Health care (HC)						
Greece (total)	**90**	**99**	**107**	**145**	**134**	**129**
Zone A	102	124	139	96	75	69
Zone B	92	97	102	136	129	126
Zone C	82	94	104	188	168	160
Zone D	77	84	91	252	237	231
Detached Houses						
Greece (total)	**27.6**	**38.7**	**37.5**	**140**	**123**	**92**
Zone A	22.5	29.6	27.3	94	89	67
Zone B	28.3	42.3	41.7	134	115	88
Zone C	24.1	35.0	33.7	159	145	108
Zone D	25.4	34.6	32.6	187	176	129
Blocks of flats						
Greece (total)	**28,1**	**40,6**	**39.2**	**96**	**95**	**75**
Zone A	24.6	31.2	28.5	65	62	52
Zone B	31.5	46.8	45.8	94	91	71
Zone C	25.8	37.0	35.4	111	109	90
Zone D	28.1	36.6	34.2	130	125	115

[31] 2nd National Energy Efficiency Action Plan 2008-2016, pursuant to directive 2006/32/EC, 2011
[32] Technical Chamber of Greece, Training of energy auditors, training material, (i) DE1. Introduction in energy sector, 2011

Figure 5.15: Climatic zones in Greece

5.4.2 Energy use and consumption in residential buildings

Since 1990, the final energy consumption in households has increased by 48%, from 3.1 Mtoe in 1990 to 4.61 Mtoe in 2010 (figure 5.16). This growing trend mainly comes from the increase of oil consumption by 30% (1.5 Mtoe in 1990 to 2 Mtoe in 2010) and a major increase in electricity consumption (electricity consumption almost doubled since 1990, from 0.78 Mtoe in 1990 to 1.6 Mtoe in 2010).

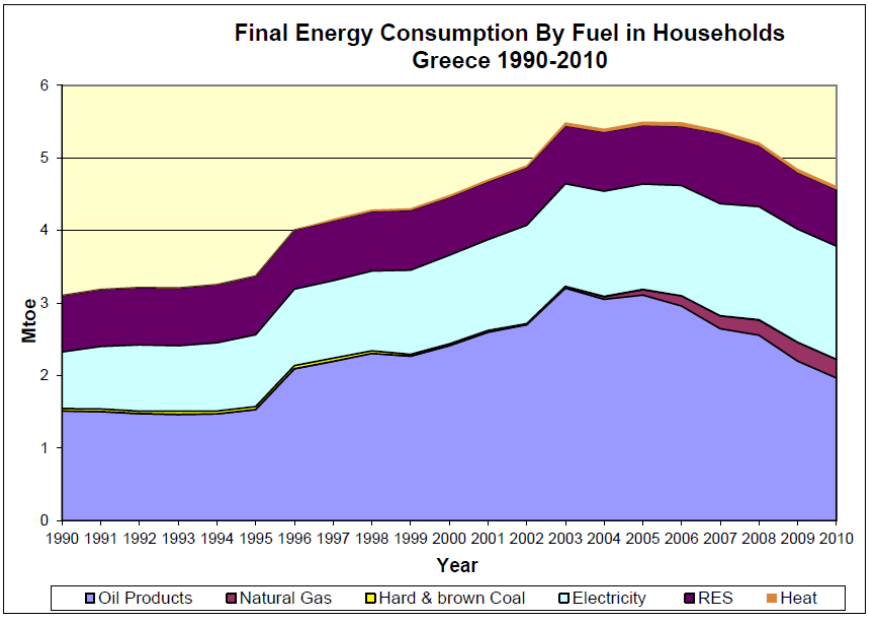


Figure 5.16: Final energy consumption by fuel in households in Greece (1990-2010)

Although until 2007 the households' final consumption was steadily increased, the households sector was one of the first sectors that sustain the effects of the economic recession in final energy consumption. This fact led to the decrease of final consumption of

household sector, over the last 2 years. The consumption of oil, which is the main fuel used by the households sector, decreased by 25.7% between 2007 and 2010. Overall, the share of oil products has slightly decreased by 6% respectively since 1990 (figure 5.17).

Since 1998, with the introduction of Natural Gas in the energy mix, the final consumption has rapidly gown (3.8 ktoe in 1999 to 255 ktoe in 2007) and this rapidly growing trend in the near future is expected to be sustained. The final energy consumption of RES has also increased by 19.2% over the last 17 years; however this percentage varies from year to year, due to the fluctuation of electricity generated from large hydropower plants.[33]

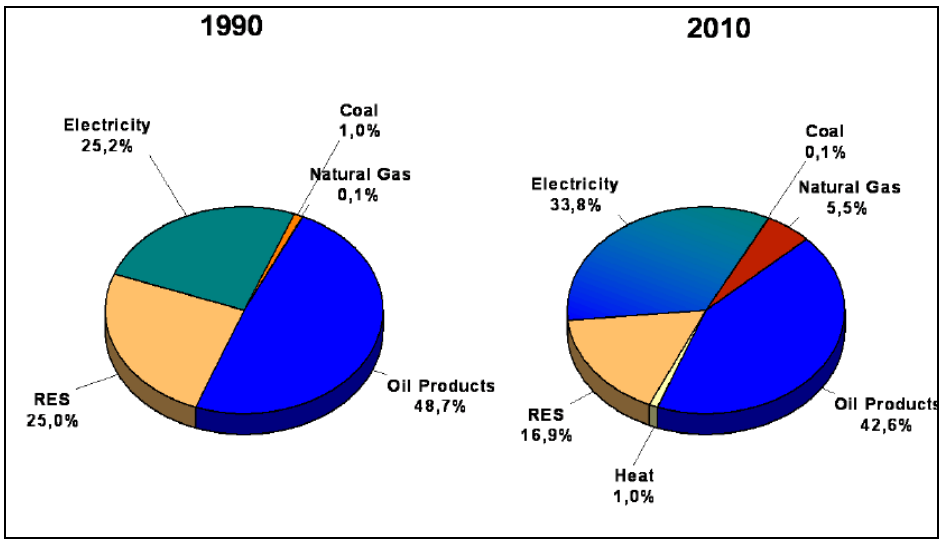


Figure 5.17: Final energy consumption by fuel in households in Greece (1990-2010)

The biggest part of final energy consumption in households is for space heating (figure 5.18). Households in 2010 consumed for space heating 3 Mtoe against 2.2 Mtoe in 1990, namely a 32% total growth in space heating energy consumption.

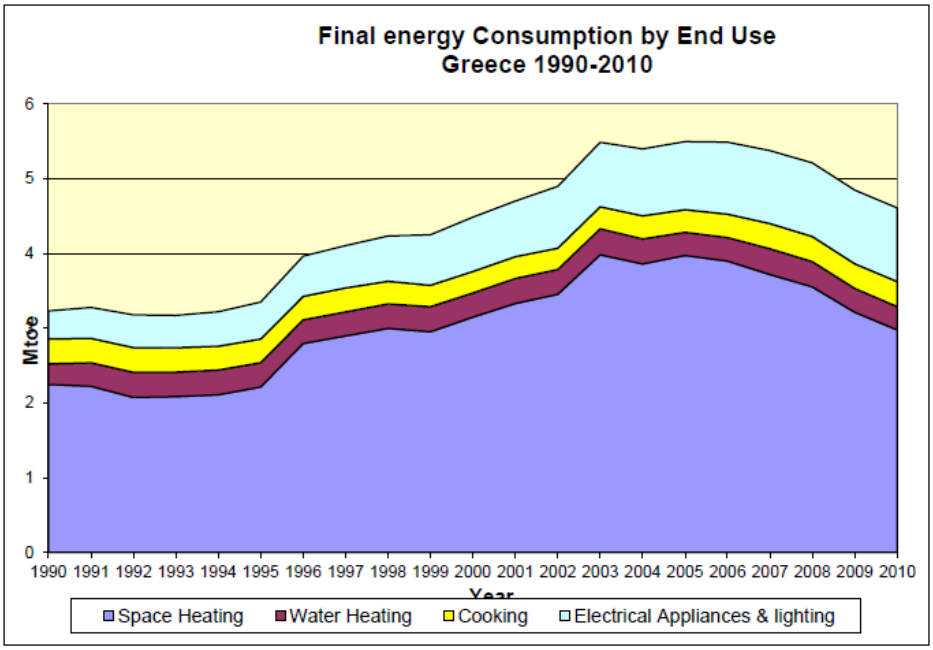


Figure 5.18: Final energy consumption by end use in households in Greece (1990-2010)

[33] Energy Efficiency Indicators in Europe, ODYSSEE MURE - IEE Programme, www.odyssee-indicators.org

The amount of energy consumed from electric appliances and lighting has almost tripled since 1990 and the energy share has been increased by 9.8%. The energy consumption for cooking remains almost constant and near 1990 levels, therefore the energy share has decreased by 3% (figure 5.19).

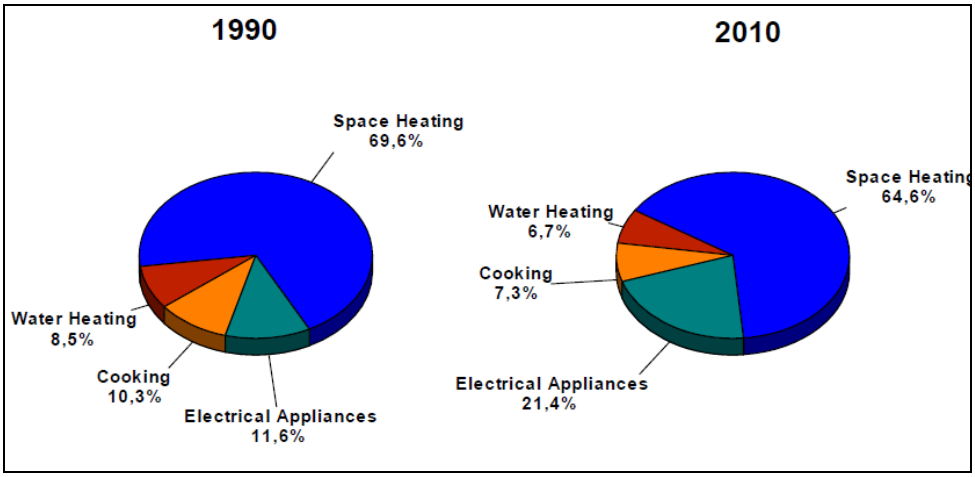


Figure 5.19: Analysis of energy end use in the residential sector (1990-2010)

Since 1990, the specific energy consumption of most of large appliances has decreased, due to sensitization of consumers in energy efficiency issues. The biggest reduction in specific consumption is observed in washing machines (23.6% reduction since 1990). However, the amount of energy consumed from TVs has increased from 228 ktoe in 1990 to 286 ktoe in 2007 and the energy share has increased by 4.3%.[33]

The main heating mean is central heating for approximately 66% of the Greek households. Other means are illustrated in Table 5.13. For cooking, 91% of households use an electric cooking stove (Table 5.14).

Table 5.13: Distribution of households by main heating means, 2004 - 2010[34]

	2004	2008	2009	2010
Central heating	68.8	68.2	66.9	65.9
Natural gas heating	0.7	5.0	6.6	7.2
Gas oil stove	8.3	5.3	5.2	5.0
Liquid gas stove	1.4	0.6	0.8	1.4
Firewood stove	6.9	6.1	5.9	5.4
Thermal accumulator	2.8	2.8	2.7	2.6
Electric heater appliances	4.4	4.4	4.7	4.7
Air-conditioner	3.2	4.0	4.3	4.8
Other means	3.0	2.6	3.2	2.3
No heating	0.5	0.4	0.4	0.5

Table 5.14: Distribution of households by main cooking means, 2004- 2010[34]

	2004	2008	2009	2010
Electric cooking stove	86.4	90.4	91.7	90.5
Gas cooking stove	12.0	7.9	6.9	8.2
Natural gas cooking stove	0.1	0.3	0.1	0.1
Firewood cooking	1.1	0.9	0.4	0.4
Other means	0.4	0.5	0.2	0.2
Not cooking			0.8	0.6

[34] Hellenic Statistical Authority, Living Conditions in Greece, 2 November 2012

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

Indicatively, for the period 1996-2007, the average electricity consumption per residential building (dwelling) in Greece is approximately 17% higher than the EU27 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 (along with Bulgaria, Croatia and Italy) that illustrate increase in heating consumption.

More particularly, the average heating consumption per m^2 in 1997 was 115 kWh, while in 2007 it was 132 kWh.[35] The consumption for lightning and electrical appliances (kWh/dw) seems to have the greater increase during the period 1990-2007 (figure 5.20).

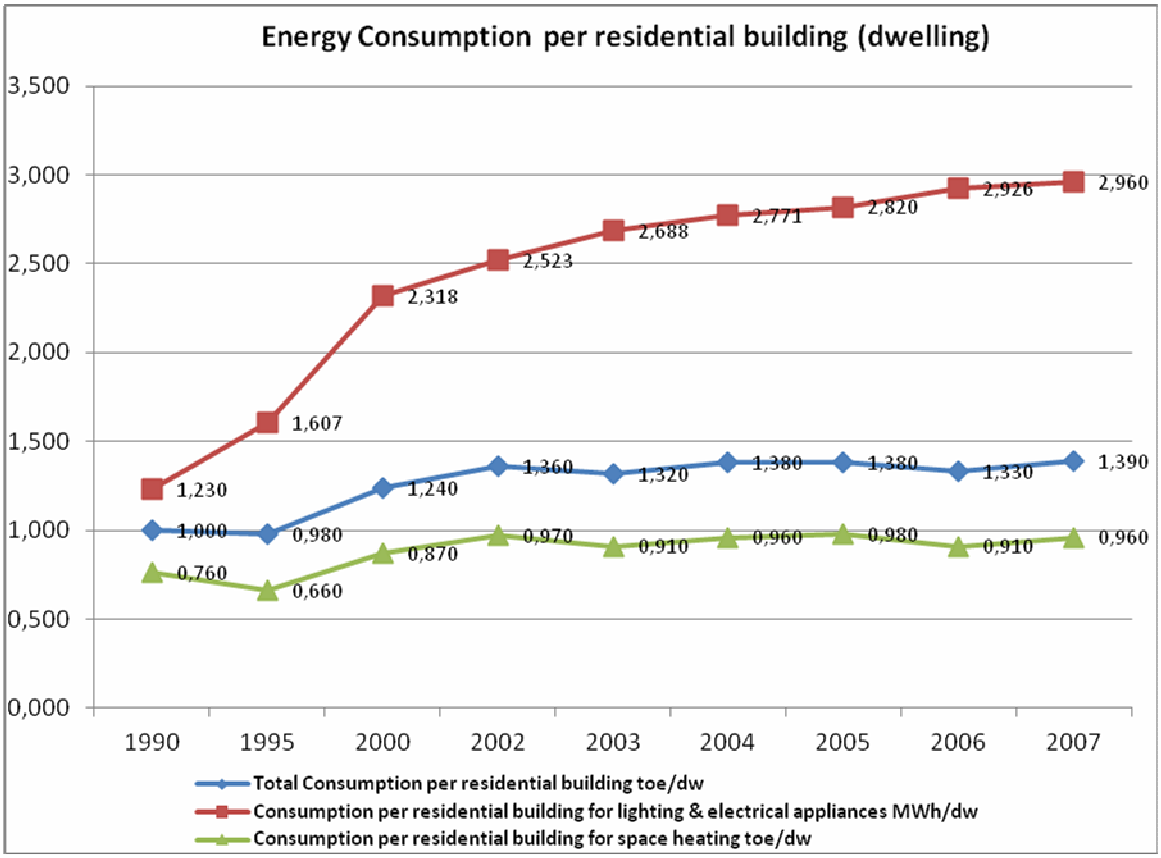


Figure 5.20: Energy consumption per residential building (dwelling)

In 2010, the "Regulation on the Energy Assessment of Buildings" Hellenic EPBD regulation – KENAK (Ministerial Decision D6/B/5825) has been in force. Since then, the Special Agency of Energy Inspectors, under the authority of the MEECC, have performed 274.000 energy audits, 69% in apartments/flats, 12% in detached houses, 8% in stores, 2% in offices and 9% in all other structures. 54% of the audited buildings have been built after 1980. According to the Agency's latest report, the majority of the audited buildings have been classified to lower energy classes, i.e. 79% below D (figure 5.21).

[35] JESSICA Instruments for Energy Efficiency in Greece Evaluation Study, Final Report, March 2010

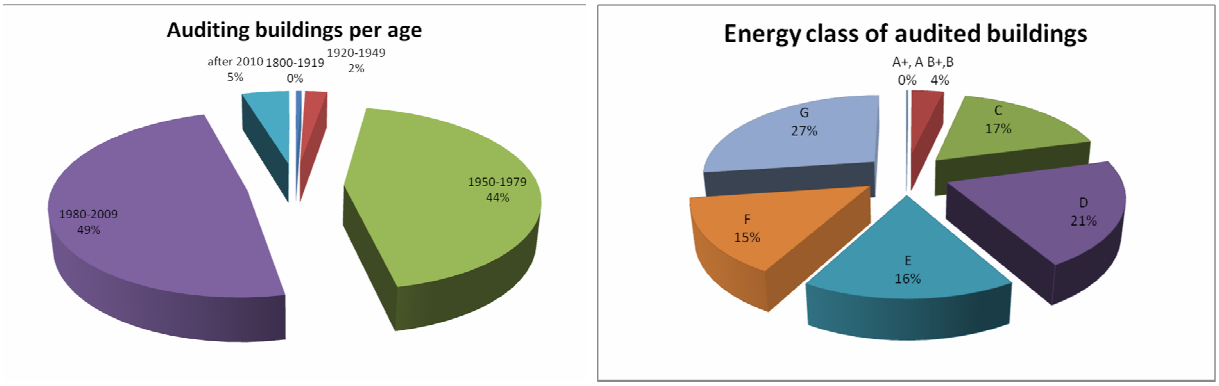


Figure 5.21: Audited buildings per age (left) and per energy class (right)

5.4.3 Measures to accelerate energy savings in buildings

The measures for energy upgrade of the building envelope and electromechanical equipment of residential buildings have been incorporated in the "Energy saving at home" programme, started in 2011. Several actions have also been recently implemented for the energy saving both in the residential (Table 5.15) as well as in the tertiary sector (Table 5.16).

Table 5.15: Overview table of measures in the residential sector[36]

Title of measure	End-use targeted	Duration	Achieved energy savings in 2010 (GWh)	Energy savings expected in2016 (GWh)
"Energy saving at home" programme – Energy upgrading of residential building envelopes, Financial aid for the upgrading of heating system boilers / burner units in existing buildings	Energy consumption for domestic hot water, heating-cooling	Start: 1/2/2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Compulsory installation of solar thermal systems in new residential buildings and financial incentives for further penetration of small-scale solar thermal systems	Energy consumption for domestic hot water, heating-cooling	Start: 2012	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
"Changing my old air-conditioner" action	Energy consumption for cooling	Start: 10/6/2009 End: 22/8/2009	Calculation using the "top-down" methodology in the residential sector	Calculation using the methodology developed as part of the first EEAP
Energy upgrading of social housing buildings- "Green Neighbourhood" programme	Total energy consumption of the target group	Start: 2011 End: 2012	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Total savings:			*** 1.76-7.23 TWh ** 7.83 TWh**	**5,533 TWh**

** Approximate methodology for evaluating the impact of economic recession*

*** Top-down calculation method defined in the proposed EC methodology «Recommendations on measurement and Verification methods in the framework of Directive 2006/32/EC on Energy end-use efficiency and energy services»*

[36] 2nd National Energy Efficiency Action Plan 2008-2016 pursuant to directive 2006/32/EC, September 2011

Table 5.16: Overview table of measures in the tertiary sector[36]

Title of measure	End-use targeted	Duration	Achieved energy savings In 2010 (GWh)	Energy savings expected in 2016 (GWh)
Compulsory installation of central solar thermal systems in the buildings of the tertiary sector	Energy consumption for domestic hot water, heating-cooling	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Compulsory installation of central solar thermal systems to meet domestic hot water requirements	Energy consumption for domestic hot water	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Compulsory procurement procedures with respect to public buildings (green procurement – energy-efficient and RES technologies)	Total energy consumption of the target group	Start: 2008	Calculation using the "top-down" methodology in the tertiary sector	Calculation using the methodology developed as part of the first EEAP
Integrated energy planning by municipalities – "Energy Efficiency" Programme	Total energy consumption of the target group Fuel consumption in transport	Start: 2009	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Compulsory replacement of all light fittings with low energy efficiency in the public sector and the wider public sector	Energy consumption for lighting	Start: 2006	Calculation using the "top-down" methodology in the tertiary sector	Calculation using the methodology developed as part of the first EEAP
Implementation of Green Roofs to public buildings	Energy consumption for cooling-heating	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed a part of the first EEAP
Programme of Bioclimatic Urban Reformation	Energy consumption for cooling-heating	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Installation of high-efficiency cogeneration of heat and power (CHP) systems with natural gas in hospitals	Energy consumption for heating, domestic hot water, electricity production	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Interventions for improving energy efficiency in school buildings	Final energy consumption in new or under construction school buildings	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Energy saving interventions in public Buildings	Final energy consumption of the buildings in the target group	Start: 2011	Does not contribute to energy savings in the period in question	Calculation using the methodology developed as part of the first EEAP
Total savings:			*** 0.05 TWh** **** 0.11 TWh**	**5,751 TWh**

** Approximate methodology for evaluating the impact of economic recession*

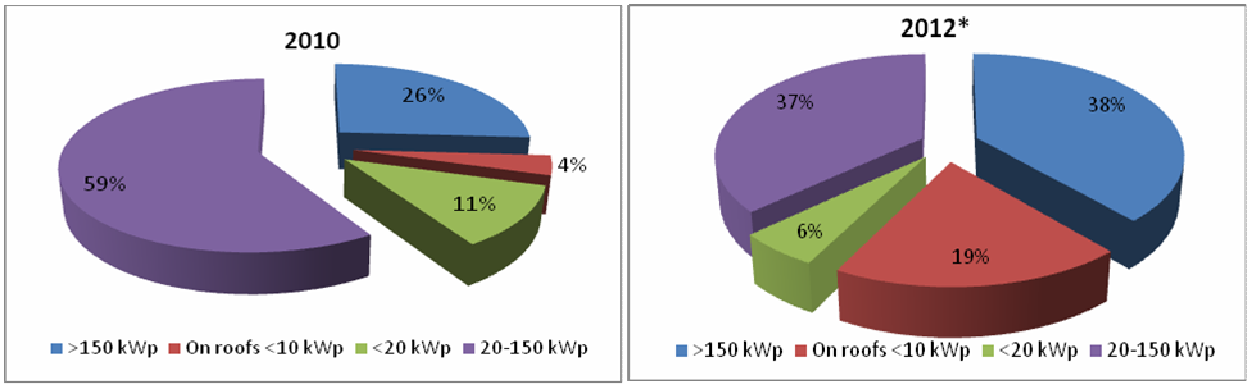
*** Top-down calculation method defined in the proposed EC methodology «Recommendations on measurement and Verification methods in the framework of Directive 2006/32/EC on Energy end-use efficiency and energy services»*

5.4.4 Renewable sources in the building sector

The available data on RES shares, as regards applications on buildings, are presented in the following paragraphs.

PV Solar market

Roof-top PV systems up to 10 kW_p (both for residential users and small companies) received a generous FIT that boosted the PV market in 2009.[37] The share of PVs on building roofs in relation to the overall PV market is increasing during the recent years; from 4% in 2010 to 19% during the first semester of 2012 (figure 5.22).



*First semester

Figure 5.22: Distribution of grid connected PV systems by size[38]

Before 2009, the Solar Roof market was practically non-existent. Following to the PV law in 2009 setting the new FITs the building roofs "market" has started. The total power of solar roofs during the period 2009-2010 is presented in Figure 5.23.

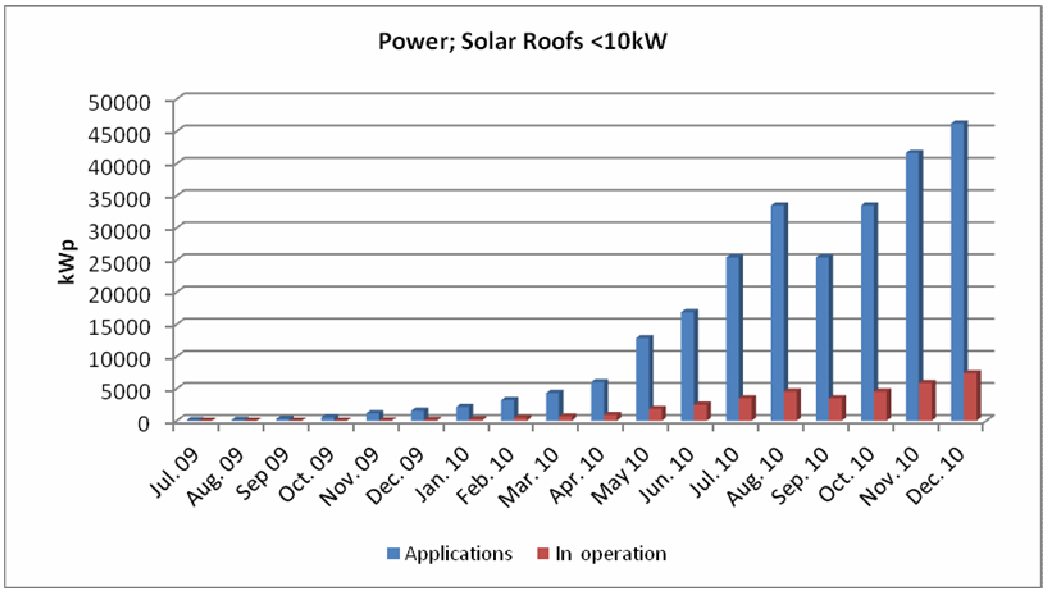


Figure 5.23: Power of Solar Roofs

Figure 5.24 illustrates the development of the grid connected PV systems in Greece. Small scale rooftop PVs (<10kW) have reached 179.4 MW during the first semester of 2012.

[37] http://www.renewable-energy-sources.com/2011/10/24/greece-feed-in-tariff-for-photovoltaic-2011
[38] http://helapco.gr

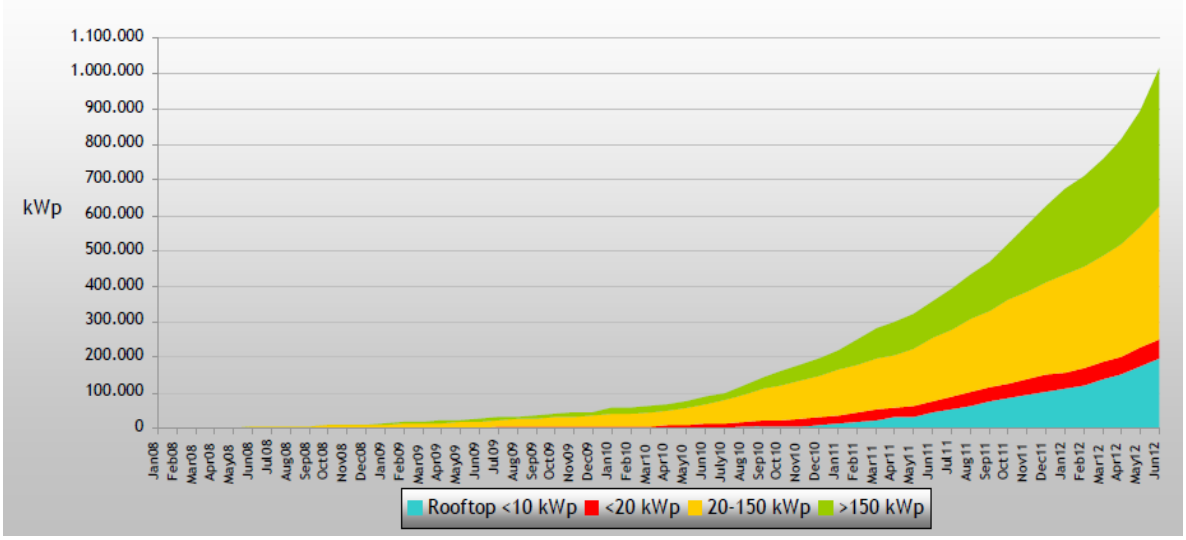


Figure 5.24: Development of grid-connected systems (cumulative installed capacity)[39]

Solar thermal market

The Greek solar thermal market has shown resilience under difficult financial conditions. The 161,000 kW_{th} of newly installed capacity in 2011 represented 7.5% growth compared to 2010 (figure 5.25).

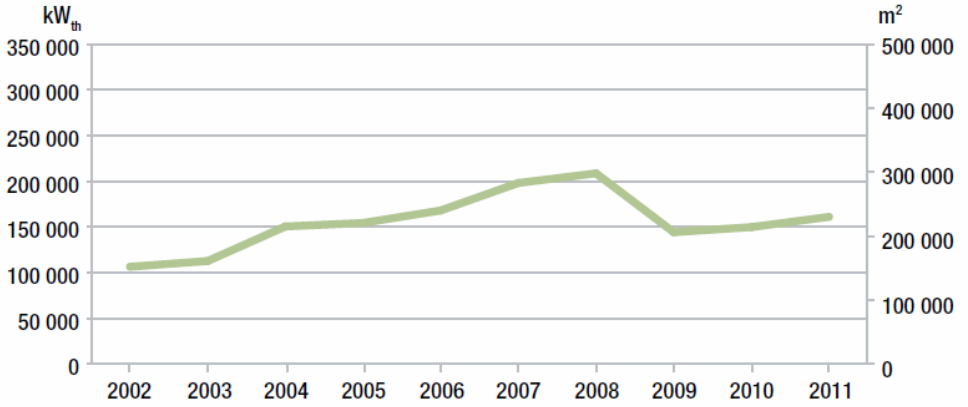


Figure 5.25: Solar Thermal Market in Greece; newly installed capacity –glazed collectors[40]

Table 5.17 presents the market size in terms of Solar Thermal Capacity (kW_{th}) and Collector Area (m^2) for the period 2009-2011.

Table 5.17: Market size of solar thermal collectors[40]

In operation*		Market (Newly Installed)					Annual Market Evolution
2011		2009	2010	2011			2011/2010
Total Glazed		Total Glazed (m^2)		Total Glazed (m^2)	Flat plate / Vacuum collectors (m^2)	Total Glazed kW_{th}	Total Glazed %
m^2	kW_{th}**						
4,087,200	2,861,040	206,000	214,000	230,000	228,500 / 1,500	161,000	7.5%

** Capacity "in operation" refers to the solar thermal capacity built in the past and deemed to be still in use; ESTIF assumes a time of use of 20 years for all systems installed since 1990; most products today last much longer, but they often cease to be used earlier, e.g. because the building is torn down, or the use of building has changed.*

*** The relation between collector area and capacity is 1m² = 0.7 kW_{th} (kilowatt-thermal)*

[39] http://helapco.gr, Greek PV Market Statistics, H1-2012
[40] ESTIF Solar Thermal markets in Europe, Trends and market statistics 2011, June 2012

Other RES systems on Greek buildings

Geothermal systems in buildings

The geothermal (ground sources) heat pumps (GSHP) systems' market in Greece is limited, especially as concerns the commercial (hotels) and public (schools) applications segments.[41] At the Traianoupolis' spas, near the northern city of Alexandroupolis, geothermal resources provide heat for a 4-building complex that includes accommodations and spa facilities. The geothermal space heating system includes production and re-injection wells, a central heat exchanger, subsurface heat transmission pipes, and floor heating. At the high school of Therma Xanthis, also in northern Greece, classrooms are heated by drawing heat from nearby thermal springs.[42]

Solar cooling systems

Solar Cooling Technology is not widespread in Greece. There are only a few systems, presented in the following table.

Table 5.18: Existing SAC applications in Greece[43]

Owner	Type of building	Cooling capacity (kWc)
"Photonio" (Sarantis SA)	Warehouse	700
American College	Educational building	168 (+7)
Demokritos Research Centre	Solar Laboratory	35.2
Lentzakis S,A,	Hotel	105
Koutroulis Bros, SA (Rethimno Village)	Hotel	105
Sol Energy Hellas A,E,	Offices / multi-house flats	35.1
CRES, demo project at PENA, Lavrio	Main building at PENA (including an auditorium)	1500 m^3/h DEC cooling

Solid biomass

The solid biomass use for heating is presented in Table 5.19 as described in Eurobserv'er Barometer.

Table 5.19: Heat consumption* from solid biomass in 2009 and 2010 in Mtoe[44]

2009	2010**
0.797	0.812

** End-user consumption (either as heat sold by district heating networks or self-consumed, or as fuel for producing heat or cold)*

*** Estimation*

In Greece, the biomass pellets associated activities (production and/or trading) are rather limited. The total consumption of pellets was about 11,100 tons in 2008; about 1 kg consumption per capita - one of the lowest in Europe.

[41] A. Goumas and I. Haldezos Centre for Renewable Energy Sources and Saving, Replication of GSHP best practice applications in the Greek market, 2012
[42] http://www.investingreece.gov.gr/default.asp?pid=36&sectorID=50&la=1
[43] Tsoutsos et. al., Development of the applications of solar thermal cooling systems in Greece and Cyprus, Fresenius Environmental Bulletin, Volume 18 – No 7b 2009
[44] Solid Biomass Barometer – Eurobserv'er – November 2011

Biomass pellets are hardly utilized in residential scale heating sector, mainly due to the ban on heaters burning biomass in large urban centres, which was in force during the last 18 years. Currently, under the CMD "Regulation of issues related to the operation of stationary sources of combustion for heating buildings and water" the termination of this ban has been decided, a progress which is expected to increase the consumption of biomass pellets in residential heating systems.[45]

District Heating

The first district heating stations have been established in 1993. Today, there are 4 district heating stations in Kozani, Ptolemaida, Amyntaio and Megalopoli; all close to thermoelectric stations of the Public Power Corporation (PPC) utilising the disposed energy of the PPC's generation facilities. The development of district heating systems is not very popular in Greece due to the mild climate. However, the climate of North-West Greece, which is similar to central Europe's, encourages the establishment of such systems which is further reinforced due to the fact that in this area there are 4 generation facilities of total capacity 4,108 MW. For this, additional district heating systems are under construction in the area; at Florina with total capacity 70 MW_{th} and at Pieria with 2 MW_{th}.

The following table summarises the existing district heating systems:

Table 5.20: District heating systems in Greece[46]

City	Initiation year	Capacity MW_{th}	Households covered
Kozani	1993	140	24,000
Ptolemaida	1993	75	11,515
Amyntaio	2001	25	9,800
Megalopoli	2011	21	N/A

5.5 Missing data

- A new Buildings Census was conducted in 2010 but the results are not yet published; the data analysis is expected to be finalized by the end of the year.
- Building companies are not monitored separately, they are included in the construction companies as the smashing majority of construction companies in Greece are activating to building works also.
- Beside the PV systems and solar thermal systems, the use of other RES technologies is low and not officially recorded yet.

[45] http://biomassenergy.gr/
[46] JESSICA Instruments for Energy Efficiency in Greece Evaluation Study, Final Report, March 2010

6. Existing VET provisions

6.1 The national VET/CVET System - Responsible Authorities

6.1.1 Description of the educational system

According to the Greek Constitution, free education must be given to all the children who live in the country. The education system is divided in:

a) Compulsory attendance: 9 years duration, 6-15 years old; primary: 6-year attendance to elementary school ("Dimotiko" in Greek) and 1st level of secondary education: 3-year attendance to junior high school, ("Gymnasio", in Greek).

b) Non-compulsory attendance: 2nd level of secondary education (3-year attendance to high school, or "Lykeio" in Greek), post-secondary education and training (vocational schools and centres, private colleges, centres of post-secondary education, etc.) and higher education (universities, technological educational institutes, military academies, merchant marine academies, etc.).

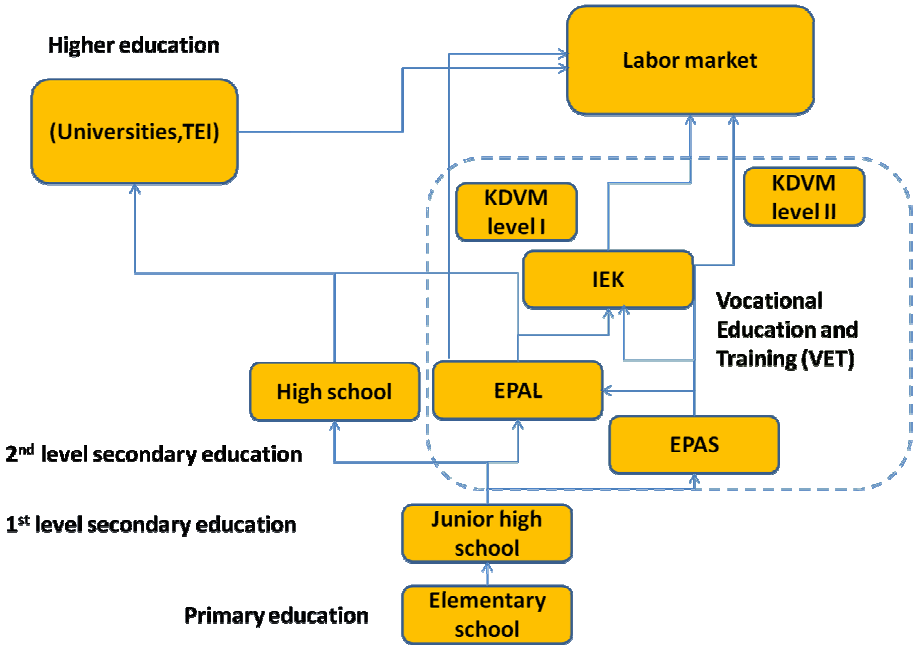


Figure 6.1: The Greek educational and vocational system
(simplified impression - the dashed-line area depicts the VET system)

The compulsory character of the 9-year education is due to the necessity for a person to have at least a junior high school certificate in order to attend to a vocational school to gain license to exercise a profession or to attend to 2nd level of secondary education and eventually higher education achieving a higher degree of training and education certificate. Although this is the formal way for someone to obtain a license for a profession, cases of technicians who exercise a profession without the appropriate license sometimes occur; this fact has consequences in the quality and safety of the work as well to the environment, tax evasion, and results to disadvantages in a number of social economic aspects.

The formal Initial Vocational Education is provided free of charge as concerns the 2nd level of non-compulsory education by attending Vocational High Schools (EPAL), or Vocational Training Schools (EPAS) for 2 years, according to Law 3475/2006.[47] At the EPAL someone

[47] https://webgate.ec.europa.eu/fpfis/mwikis/eurydice/index.php/Greece:Overview

can attend at day classes for 3 years or in the evening classes for 4 years. Post-compulsory secondary education also includes the Vocational Training Institutes (IEK), which provide formal but unclassified level of education. These Institutes are not classified as “educational level”, because they accept both 1st level and 2nd level secondary school graduates according to the relevant specializations they provide. Continuing Vocational Education and Training is further analysed in the following sections.

6.1.2 Adult education in Greece

Definitions of terms of lifelong learning (LLL)

According to Law 3879/2010 on the development of lifelong learning, the following definitions for adult education are given:

- **Lifelong learning**: All forms of learning activities during the life of a person, aimed at the acquisition or development of knowledge actions, skills and abilities, which contribute the formation of an integrated personality, employability, development of his/her social cohesion, ability of active participation to citizenship and to socio-economic and cultural development. It includes **formal education**, **non-formal education** and **informal learning**.
- **Formal education**: education within the frame of the formal educational system (primary, secondary and tertiary education), which leads to certificates recognized at national level by public authorities and constitute part of the classified educational scale. Formal education includes the general adult education.
- **Non-formal education:** education provided in educational contexts organized outside the formal educational system; may lead to a formal qualification recognized nationally. It includes **initial vocational training** (IVT), **continuing vocational training** (CVT) and **general adult education**.
- **Informal learning:** Learning activities that take place outside organized education framework, throughout the life of a person either on leisure or professional, social and cultural activities. It includes all activities of self-education, such as self-education with written material of via internet or by using a computer or various educational infrastructures, as well as the knowledge, skills and abilities acquired by a person by his/her professional experience.
- **Initial vocational training (IVT)**: The training that provides basic professional knowledge, abilities and skills in disciplines and specializations towards integration, reintegration, job mobility and advancement of human resources labour market as well as at the professional and personal development.
- **Continuing vocational training (CVT):** training of the human resources to complement/update or upgrade knowledge, abilities and skills, gained from the vocational education and initial vocational training or professional experience with regard to integration or reintegration into the labour market, to safe employment environment market as well as to professional and personal development.
- **General adult education**: Includes all organized learning activities addressed to adults, aiming at enriching their knowledge, in development, improvement of abilities, skills, in personality development, in active participation to citizenship, as well as in the mitigation of the educational and social inequalities. It provided by institutions of formal education and non-formal education.

Funding

The financing of LLL is provided by the state, EU or private resources. The actions and programs implemented by governmental/public entities are funded primarily by the Operational Programmes (OP) "Education and Lifelong Learning" and "Human Resources

Development" and other OPs of the National Strategic Reference Framework (NSRF) 2007-2013, such as "Administrative Reform", "Competitiveness and Entrepreneurship". NSRF's Operational Programmes are co-financed by Greece and the EU. The tendency is to decentralize the Institutions providing LLL towards the supervision and funding by local authorities (municipalities and region authorities). However this is not realized yet.

Participation rate

Early school leavers are the target group for Second Chance Schools (SDE), the general population, immigrants, farmers. The LLL indicator value for 2008 was 2.9%. The main obstacles for the non-participation were the lack of time due to family and work time. The cost is the next reason (Eurostat yearbook 2010).

Topics of adult education

- New technologies ("green jobs", IT, etc.)
- Completion of general education (Second Chance Schools),
- Literacy, language history, culture for immigrants
- Parents' education
- Farmers training
- Health education
- Civil protection.

Trainers

In public institutions, like second chance schools, teachers from secondary education are the main staff. In the rest of institutions, trainers are hired for each course according to specific criteria and qualifications. A centre for distance training of adult trainers and managers is functioning under the General Secretariat for LLL.

Quality system / certification

General Secretariat for Lifelong learning (GSLLL) and the National Organization for the Certification of Qualifications and Vocational Guidance (EOPPEP) are the main national authority bodies which put specific restrictions concerning trainer's qualifications and infrastructures. The recent developments refer to the legal framework for LLL included in Law 3879/2010 are focused on the following scheme:

- All Lifelong learning activities are organized under a general national framework.
- All activities and funding are included in the national programme for LLL and the implementation programme.
- The national qualification framework and the vocational profiles are introduced.
- More synergies between LLL and employment are introduced.
- More procedures for accreditation and quality assessment are introduced
- The LLL implementation in Municipalities and regions is defined

Drawbacks

Major drawback on complete activation of the Law 3879/2010, is the prediction of a plethora of regulatory acts. Two years after the launch of the law, weakness is noted of first and

second degree local authorities to get involved in the provision of LLL in the scale set out in Law 3879/2010. However, there have been important steps for the implementation of law, while the organization and systematization of LLL into a unified framework remains a major challenge.

6.1.3 Description of the VET system in Greece

Lifelong training is connected to employment and includes initial (IVT) and continuing vocational training (CVT).

Institutional framework for Vocational Education and Training

In Greece, the national institution framework for the vocational training is described by the following laws:

- L.3191/2003 (Official Governmental Gazette 258 A'/07.11.2003) in which institutionalized the National Association of Vocational Education and Training to Employment.
- L.3369/2005 (Official Governmental Gazette 171 A'/ 07.06.2005) on the systematization of lifelong learning.
- L.3879/2010 (Official Governmental Gazette 163 A'/ 21.09.2010) on the development of lifelong learning.
- Ministerial decision 119959/H (Official Governmental Gazette 2351 B'/20-10-2011) for the merging of National Accreditation Centre for Lifelong Learning (EKEPIS), National Centre for Vocational Guidance (EKEP) and National Board Certification Qualifications (EOPP) monitoring by the Ministry of Education & Religious Affairs, Culture & Sports to a single statutory body named "National Organisation for the Certification of Qualifications and Vocational Guidance" (EOPPEP).
- Law 4093/2012 (Official Governmental Gazette 122 A'/12.11.2012) on Medium Term Fiscal Strategy Program.
- Law 4115/2013 (Official Governmental Gazette issue A 24/30.1.2013) on the establishment of Youth and Lifelong Learning Foundation.

In the provision of the above laws, definitions are given for both IVT and CVT, and also for the VET education system. According to these definitions:

- **VET education system:** Combines both general technical education and vocational knowledge and skills. These are provided by the Vocational Education Training Schools (EPAS) and the Vocational High Schools (EPAL). The EPAS and EPAL schools are under the authority of Ministry of Education & Religious Affairs, Culture & Sports.
- **Initial vocational training (IVT) system:** Provide the basic vocational knowledge and skills in specialties or specializations, focused in integration, reintegration, vocational mobility and development of human resources in labour market and career advancement. Typical providers of initial vocational training are the **Vocational Training Institutes** (IEK) which can be public or private legal entities monitored by EOPPEP.
- **Continuing Vocational Training (CVT) system:** operates in the context of lifelong learning and aims to training or retraining of human resources, which complements, update or upgrade knowledge and skills acquired from other vocational education and training and/or professional experience, targeting to market integration, working to secure employment, career advancement and personal development. Providers of Continuing Training are the Vocational Training Centres or **Level II Lifelong Learning Centres** – KDVM II (former KEKs) which are focused in specific thematic areas, defined by the institutional framework of their certification (JMD No. 110327/2005, Art. 3, Official Governmental Gazette 230 B'/21.02.2005). The Level II KDVM Centres can be private entities (profit or non-profit) or public providers of CVT. The authority which is responsible for the certification of Level II KDVM Centres is the EOPPEP.

However, by the most recent Law 4093/2012 (Medium Term Fiscal Strategy Program) significant changes at various levels were introduced, particularly with respect to licensing of LLL providers, amongst others:

- Licensing of private IEK is assigned to jurisdiction of the Minister of Education and Religion Affairs, Culture and Sport, instead of EOPPEP, which holds advisory role.
- New definition of LLL structures of KEKs and Freel Studies Workshops (EES): KEKs are now called “LLL Centres Level II” (KDVM Level II) and Freel Studies Workshops are renamed as “LLL Centres Level I” (KDVM Level I), which is authorized by the Board of EOPPEP. The distinction is based on the infrastructure. Where other provisions refer to "independent study" means KDVM Level I, where "Vocational Training" KDVM level II.
- Since 30-06-2013, provision of the public IEKs is transferred to the Regions: organization and functioning of public IEKs is monitored by the Regions, and the configuration and monitoring of educational framework is under the responsibility of GSLLL.

Currently, EOPPEP licenses Private Vocational Training Institutes (IIEK), and accredits the KDVM Level II Centres (former KEKs).

6.1.4 Initial Vocational Education and Training (IVET) at EPAS and EPAL schools

According to the Ministry of Education & Religious Affairs, Culture & Sports (MERACS), in the school year 2009-2010 there were 109 Vocational Education Training Schools (EPAS), and 393 and Vocational High Schools (EPAL) in operation.

Vocational Education Training Schools (EPAS)

The initial vocational education and training is provided during a 2-year attendance at EPAS. If training includes an apprenticeship or an on-the job period, attendance is extended by up to one year. Specializations offered by the EPAS depend on the demand of students and the socio-economic situation and needs of each area. Pupils who have successfully completed the 1st grade of either Vocational or 2nd level secondary high school may subsequently enroll in the 1st grade of EPAS.[48] According to the MERACS, 12,000 pupils (7,000 at 1st grade and 5,000 at 2nd grade) are studying in EPAS which all daily attending schools (morning and afternoon). From the 33 specializations offered, only 4 are related to the building sector including EE and RES related specializations (see table below).

Table 6.1: EPAS’ specializations related to the building sector[49]

No of Category *According to Official Governmental Gazette*	Specialisations
3.	Hydrothermal Installations and Central Heating Maintenance
6.	Electrical Works Technician
7.	Building Works
8.	Internal Space Planning

There is also a large number of EPAS which are supervised by the Greek Manpower Employment Organization (OAED)[50], where there are specializations related to the building sector (see Table below).

[48] http://edu.klimaka.gr/leitoyrgia-sxoleivn/epaggelmatika/epas/97-eidikothtes-epas-epaggelmatikes-scholes.html
[49] Official Governmental Gazette 947/2007 –no 56645/C2, Determination of Specializations at EPAS
[50] http://epas.oaed.gr/

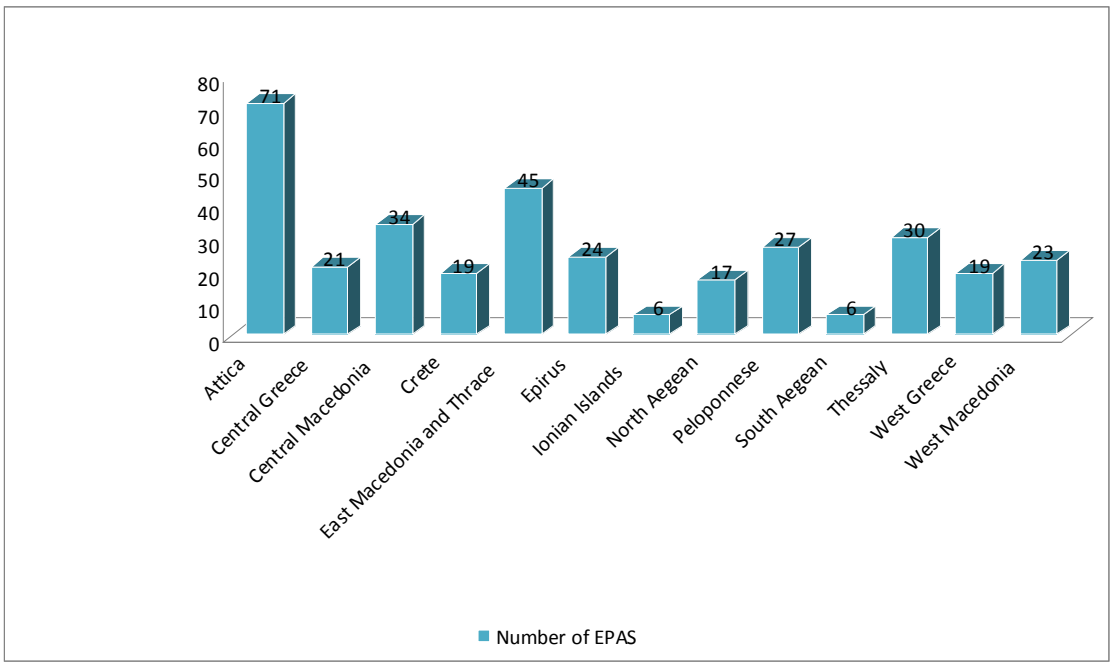


Figure 6.2: Number of EPAS supervised by OAED – Regional distribution[51]

Table 6.2: Supervised by OAED EPAS specializations related to the building sector

Specialisations
Building Works Technician
Carpenters / Joiners
Electrical Works Technician
Thermal and Plumber Installations Technician
Metal Structures Technician
Refrigeration and air conditioning installer

Vocational High Schools (EPAL)

Enrolment in the 1st grade is without examination upon the submission of a school-leaving certificate from a 1st level of secondary junior high school. Each pupil except of the general educational modules selects a cycle of similar professional sectors – as stipulated by the provisions of the respective ministerial decision (MD 36618/C2). In the 2nd and 3rd grades, in addition to the core modules of general education, there are modules of vocational sectors and specializations. Upon registration in 1st grade of EPAL pupils select the cycle they wish to attend. Upon registration in the 2nd grade, they select their field in relevance with the subject cycle attended in the 1st grade and, finally, in the 3rd grade pupils select the specialization they wish to follow, provided it corresponds to the field selected in the 2nd grade.[52]

According to the MERACS, from the 393 EPAL, the 333 are daily schools and 60 are evening schools. There about 80,000 pupils attending to EPAL, where about 22,000 of them are attending in the 3rd grade. In EPAL from the 19 specializations, only 4 are related to the building sector including EE and RES related specializations (see below table).

[51] http://www.oaed.gr/el/2012-05-30-14-51-25
[52] Ministerial Decree 36618/C2/2007

Table 6.3: Sectors, Fields and Specializations, related to the building sector, in EPAL[53]

Cycle 1st grade	Fields 2nd grade	Specialisations 3rd grade
TECHNOLOGY	Engineering	Mechanical installation and construction
		Cooling equipment and air conditioning
	Electrician	Electrical facilities
	Construction	Construction Designer

Graduates of EPAL may:

- seek admission to departments or faculties of Higher Education Institutes (after exams);
- receive a license to practice a trade (after exams);
- enroll in a Vocational Training Institute (IEK).

A detailed table with training courses relevant to EE/RES in the building sector delivered by IVET structures is presented in Annex II.

Vocational Training Institutes (IEK)

Vocational Training Institutes (IEK) run under post-compulsory secondary education and offer formal but "unclassified" training since they enrol both 1st and 2nd level of secondary school graduates (junior high schools and high schools, EPAL and EPAS schools), according to the courses offered. High school graduates receive initial training, to acquire all necessary skills and facilitate integration into the labour market whereas EPAL graduates may supplement their professional knowledge and receive further training. The duration of training depends on the course selected by the candidate trainees and on their qualifications. It may vary from one up to four semesters.

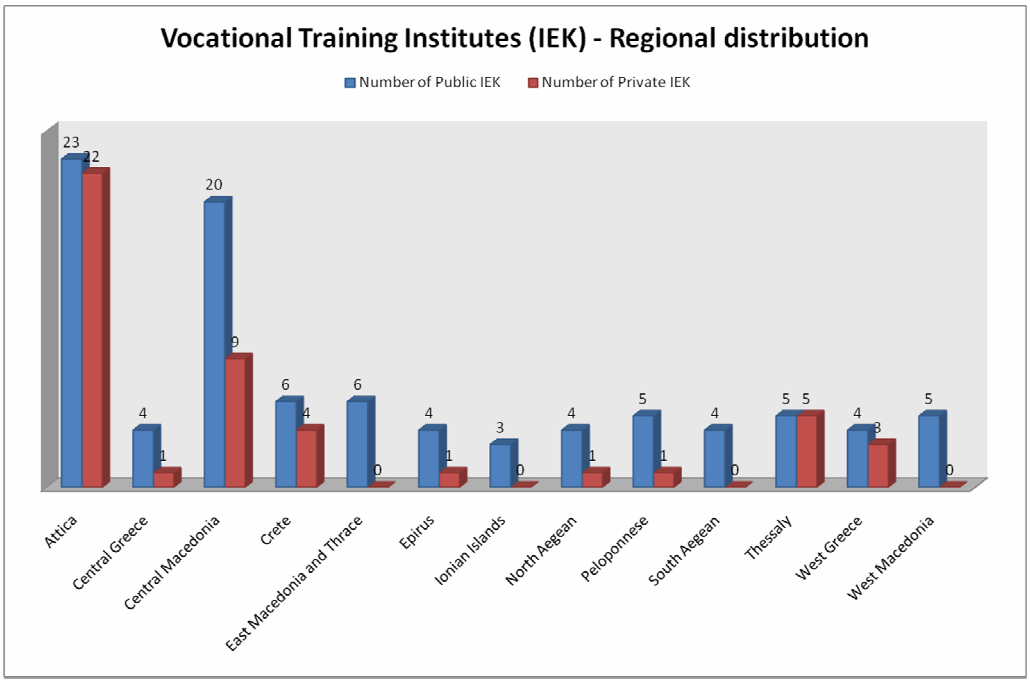


Figure 6.3: Number of IEK's – Regional distribution[54]

[53] http://www.ete.gr/index.php?option=com_content&view=article&catid=36:2008-03-12-22-24-15&id=55:2008-03-19-20-21-07&Itemid=58
[54] http://www.infomathisi.gr/leftmenu/anotati_ekpaideusi/iek/

Other ministries or public entities may establish an IEK (Vocational Training Institute), which must operate under a joint decision of the competent Minister and the Minister of Finance. However, specifications and approval of the IEK training courses curriculums are under the responsibility of EOPPEP.[55] There are also private run IEKs, supervised by EOPPEP, operating with curriculum and range of courses similar to the ones that the public IEKs have.

In the following tables, the existing specializations with regard to the building sector, currently operating by IEKs for the 1st and 2nd level of secondary school graduates, are shown.

Table 6.4: Specializations of IEK, for the 1st level of secondary school graduates (building sector)[56]

Sector	Specializations
Building and Related Constructions	Plasterer (level 1)
	Painter (level 1)
	Builder (level 1)
	Aluminium and iron constructions technician
	Mosaics and Paving technician
Applied Arts	Carpenter
Engineering	Heating Installations Technician

Table 6.5: Specializations of IEK for 2nd level secondary school graduates (building sector)[56]

Sector	Specializations
Building and Related Constructions	Building Works Technician
	Maintenance and repair of historical and traditional buildings
Electrical	Automation Technician
	Internal electrical installations technician
Engineering	Refrigeration and air conditioning technician
	Thermal and Plumber Installations technician

6.1.5 Continuing Vocational Training

Lifelong learning Training Centres (KDVM Level II)

Continuing Vocational Training includes all vocational training and further training activities organized outside the formal initial vocational training and education system. CVET in Greece is provided by a plethora of entities which focus on specific target groups and are supervised by different ministries. The existing institutional framework focuses on four categories:[57]

- Training of the unemployed;
- Training of private-sector workers;
- Training of wider public sector workers;
- Training of socially disadvantaged groups.

The vocational training programmes are short-term and the hours of tuition depend on the subject, the curriculum and the targeted participants. The Lifelong learning Training Centres (KDVM Level II – the former KEKs) organise training programmes with a view of combining training and employment. According to EOPPEP, there are 516 accredited KDVM Level II (public and private).[58] The regional distribution is illustrated in the following figure.

[55] Organisation of Educational System, Eurybase 2010
[56] http://cert.gsae.edu.gr/iek/index.php/ergaideke/menu11-2
[57] http://www.ekep.gr/english/Education/sunexizomeni.asp
[58] http://www.eoppep.gr/index.php/el/search-for/learning-institutions/kek

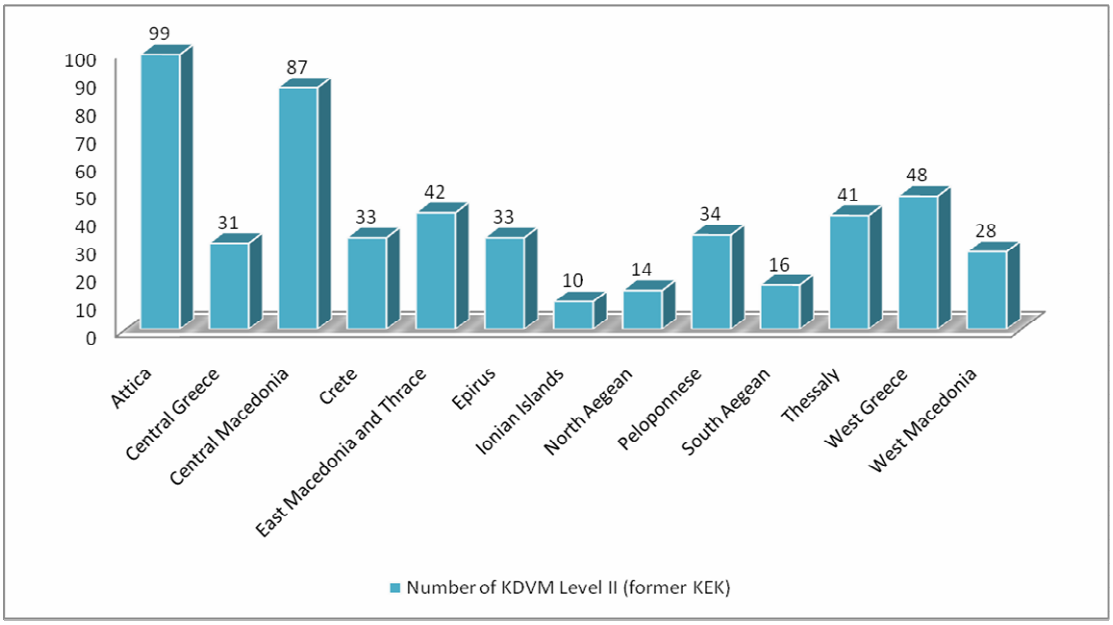


Figure 6.4: Number of accredited KDVM Level II (former KEK) per region
(Joint Ministerial Decision 110327/21.2.2005)

The CVET programmes include theoretical training and practical exercises in firms. In several cases, trainees are awarded a subsidy to attend. The KDVM Level II centres perform trainees' assessment on the basis of the training curriculum; on successful completion the trainees receive an attendance proof /certificate.[59]

Funding sources of CVET in Greece

Despite CVET is not part of formal education, it is co-financed by the European Social Fund and the state. CVET is provided by the public KDVM Level II Centres of Greek Manpower Employment Organisation (OAED) at national level. Private KDVM Level II Centres and KDVM Level II Centres run by social partners also provide CVET funded by the state, since many of their training programmes are subsidized by OAED. More specifically, OAED funds a number of CVET programmes which have been selected following to submissions through a public call.[60]

CVET is called upon to play a critical role for the current workforce development due to the economic crisis, high level and still rising unemployment, large-scale restructuring of large sectors of public administration. Given also the profound importance of CVET to Greece's (currently low) competitiveness, CVET must also become more effective than in the past.[61]

6.1.6 Responsible Authorities for CVET in Greece

- **General Secretariat for Lifelong Learning** (GSLLL): In 2008, the General Secretariat for Adult Education was renamed to General Secretariat for Life Long Learning (GSLLL). It is part of the Ministry of Education & Religious Affairs, Culture & Sports and is responsible for lifelong learning in Greece.
- **National Organisation for the Certification of Qualifications & Vocational Guidance** (EOPPEP). EOPPEP is a new organization, established at the end of 2011, merging the

[59] http://www.pesmonitor.eu/Database/DatabaseNew.aspx?Lang=EN&PES=10&Topic=1&Content=1
[60] VET in Greece, 2011, Institute of Entrepreneurship Development, Larissa, Greece, University of the Aegean, Mytilene, Greece
[61] D. Karantinos, *Strategies for Reforming Continuing Vocational Training (CVT)*, October 2011

National Accreditation Centre for LLL providers (EKEPIS), the National Organisation for Vocational Guidance (EKEP), and the National Organisation for the Certification of Qualifications (EOPP). It is operating under the supervision of the Ministry of Education & Religious Affairs, Culture & Sports[62] and is responsible for certifying the outputs of lifelong learning, i.e. knowledge, skills and competences that individuals will acquire through learning. EOPPEP is responsible for: the creation and development of the NQF and its referencing to EQF; the correspondence of qualifications gained through non-formal and informal learning with the NQF levels; the recognition and validation of non-formal and informal learning, the issuing of licenses for training providers and the monitoring of bodies validating non-formal and informal learning.[63]

Law 3879/2010 has launched the operation of the National Network for LLL for coordinating administration bodies with distinct responsibilities/operations and LLL providers in the learning areas of:

- Initial Vocational Education & Training (IVET)
- Continuing Vocational Education & Training (CVET)
- General Adult Education.

The network involves cooperation to the following areas:

- diagnosis of adult education and training needs in response to the labour market needs and the social growth;
- provision of LLL guidance and counselling services;
- accreditation of providers, trainers, occupational profiles and non-formal education curricula;
- recognition of occupational qualifications and certification of knowledge, skills and competences;
- recognition of professional rights in equivalence to occupational qualifications;
- information, dissemination and communication.

6.2 Certification and accreditation framework

6.2.1 Certification of qualifications

Accreditation/licensing of providers of non-formal education

EOPPEP accredits and licenses providers of non-formal education encompassing initial and continuing vocational training upon legislated criteria for infrastructure, trainers & curricula, as well as enacted specifications for the organisation and operation of the provider, employed staff and provided services. Additionally, EOPPEP licenses Private Vocational Training Institutes (IIEK) and KDVM LEVEL II Centres.

National Qualifications Framework (NQF)

EOPPEP is the statutory body for the development and implementation of the Hellenic Qualifications Framework (HQF) in correspondence with the European Qualifications Framework (EQF). Additionally, EOPPEP is the National Coordination Point for EQF in Greece (NCP).

[62] Joint Ministerial Decision 119959/H – Official Governmental Gazette 2351/20-10-2011

[63] A. Manoudi, *European Inventory on Validation of Non-formal and Informal Learning 2010, Country Report: Greece*, DG Education and Culture in co-operation with the European Centre for Development of Vocational Training (Cedefop).

Certification of qualifications

EOPPEP develops the regulatory framework for the certification of qualifications, i.e. the learning outcomes of non-formal education and informal learning, in response to labour market needs and priorities and in liaison with the accreditation of inputs, i.e. providers, trainers, occupational profiles and curricula standards. EOPPEP's current fields of responsibility are the certification of the qualifications listed below and the licensing of awarding bodies, as follows:

- Development of a national system for the certification of qualifications: it is EOPPEP's principal policy priority in the field of lifelong learning (LLL).
- Development of a model system for the accreditation of outputs and setting the respective legal framework.
- Designing a system for the recognition and certification of qualifications acquired via non-formal and informal learning and establishing the framework for licensing awarding bodies.
- Inspection, monitoring and evaluation of awarding bodies.

The National System for the Certification of Qualifications aims at:

- certifying those qualifications for which a state interest is attested and those which reinforce employment,
- assuring the certified qualification corresponds to the specifications set in the respective accredited occupational profile and the accreditation/certification process is in compliance with set standards and criteria,
- providing equity and open access to qualifications, irrespective of the learning pathway and regardless of the way learning outcomes have been acquired.

6.2.2 Accreditation/certification procedures

The accreditation of vocational training and the certification of the vocational training institutes' (IEK) graduates embed a national accreditation exam procedure conducted at national and regional level and based on the vocational training exam regulation framework per specialty. EOPPEP organises at national level the examinations for IEK graduates of all specialities. Upon successful examination results, IEK graduates are awarded the Vocational Training Diploma recognised both in Greece and in EU member states (for lower secondary education graduates) or the Certificate Level I (for upper secondary education graduates).

6.2.3 Accreditation of occupational profiles & curricula standards

EOPPEP accredits occupational profiles with the active contribution of the social partners in the process of their development. An occupational profile is defined as the job functions and the required knowledge, skills and competencies for exercising an occupation or specialty. Based upon accredited occupational profiles, EOPPEP is planning to develop standards and specifications for modularized curricula with credits.

The term of "occupational profile" as the definition of the certification of profession objective is relatively new in Greece, since it was established for the first time by law in 2005.[64] By definition, the occupational profile is the sum of all basic and advanced vocational functions as well as all the acquired knowledge, skills and abilities that a person should have in order to respond effectively to the demands of a profession.

[64] L.3369/2005 (Official Governmental Gazette 171 A'/ 07.06.2005) on the systematization of lifelong learning

In that sense, the occupational profiles introduce the concept of cognitive parameters which consists the work objective of a profession, by forming the profile of all professions, especially those ones of high demand in the labour market. In particular, an innovative system of qualifications and vocational standards as a set of knowledge, skills and competencies is introduced.

By the time this report was written, EOPPEP had certified 202 occupational profiles, from which only 10 are related to EE and RES applications in the building sector, and are presented at the following table.

Table 6.6: Description of Occupational Profiles related to EE/RES of building sector certified by EOPPEP[65]

Profession	Short description	Current employment status
Aluminium/iron constructor	Processing of aluminium architectural profiles in order to manufacture and place in buildings frames and other custom made aluminium alloy constructions for the exterior protection and appearance as well as the interior arrangement of a building.	The profession shows dynamic growth in an intense competition. The demand for aluminium/iron manufacturers is high.
Burners installer – superintendent	A burners' installer-superintendent undertakes maintenance, repair or new installation of burners using oil, gas, and other special fuels. Also the control, cleaning and maintenance of the boiler, the burner and the other parts of a central heating installation.	Boiler installers have encountered few problems of employment, due to the crisis however, they have not been affected as other professions in the construction sector. This is due to the fact that there is high demand for the maintenance of boilers (low demand for installing new ones).
Glass technician / glazier	The technician, who places, repairs and installs glasses in construction establishment, houses and industries.	The sector shows strong growth due to the development of the glass industry which indicates glass as a necessary material able to meet the modern trend in architecture. Therefore, the prospects of employment in the sector are positive.
Management and utilization of biomass technician	Technical work related to the management and use of biomass to produce energy, fuel or fertilizer.	There is no official record of workers employed in the biomass sector in Greece. The sector is labour intensive and can create jobs at the local and regional level. Jobs required for the operation of electricity generation from biomass is about four times higher than those required for power plants from fossil fuels.
Solar energy system manufacturer technician	Technician able to manage effectively raw material, processes and human resources in order to ensure that the products meet construction specifications and EU standards.	According to data from the Greek Solar Industry Association (EBHE), in Greece currently operate more than 150 small and large businesses manufacturing solar thermal systems (solar water heaters), from which 25 are members of EBHE. The EBHE members employ about 1,200 people, while the whole thermal solar sector is estimated to employ approximately 3,000 employees

[65] Joint Ministerial Decision 110998/8-5-2006/ Government Gazette 566 B/8-5-2006 566 on the Certification of Vocational Profiles

Insulation technician	Performs basic work on thermal insulation, sealing, sound insulation, passive fire-protection.	This occupation has great dynamics due to the fact that even in periods of recession the insulation sector is less affected as works greatly involve existing buildings and structures.
Refrigeration and air conditioning technician	Technical assembly, installation, connection, repair, replacement, testing, maintenance, supervision and inspection of the operation of refrigeration and air-conditioning in buildings, industry and transport.	Official statistics show that the number of workers in the occupation is low, but in recent years the technology profession is evolving very rapidly
Combustion gas technician	Performing tasks related to the installation, maintenance and modification of networks and devices of gas fuels for domestic, commercial and industrial use. Also deals with bigger pipelines for the transmission and distribution of gas fuels.	The demand for the employment increases daily for the reason why enlargements of use of natural gas is taking place in domestic, professional and industrial sector, creating thus a new dynamics in the job market.
Stone craftsman	Processing stone building for the construction of houses, cobbled streets, and dry stone wall structures. Such technician constructs bridges, schools, churches, fireplaces, fountains, cobbled streets, etc.	Employment prospects are depending from the construction industry development in technical infrastructure and private projects on conservation of cultural heritage and the creation of sustainable buildings.
Technician of plumbing installations	Undertakes maintenance, repair or new installations of pipes for fluids, mainly cold water pipes, or central heating hot water pipes, and also of drainage systems, swimming pools, irrigation systems, fire fighting networks, geothermal installations.	All scientific research work and all forecasts, predict that the technician of plumbing installations can expect for the future a positive trend for their employment opportunities in Greek.

6.2.4 Accreditation bodies relevant to building sector

Hellenic Accreditation System (ESYD)

The Hellenic Accreditation System (ESYD), a private legal entity operating under the supervision of the Greek State, is the competent body for the management of the accreditation system in Greece. ESYD has been appointed as the National Accreditation Body of Greece according to the requirements of Article 4 of the Regulation (EC) No 765/ 2008, according to which each Member State shall appoint a single national accreditation body and its share capital has been undertaken by the Greek State. ESYD is supported in its tasks by a number of Technical Committees, consisted by experts in particular industry sectors.

The organization employs external assessors and experts. The assessors are selected and trained according to strictly defined criteria and procedures and they must comply with specific regulations concerning their independence, integrity and confidentiality. ESYD is responsible for the accreditation of certification bodies involved in personnel certification according to ELOT EN ISO/IEC 17024.[66]

Hellenic Association of Accredited Certification and Inspection Bodies (HellasCert)[67]

[66] http://www.esyd.gr/portal/p/esyd/el/index.jsp
[67] http://www.hellascert.gr/en/site/index.html

The Hellenic Association of Accredited Certification and Inspection Bodies (HellasCert) operates in Greece in the voluntary and statutory sector in line with EU standards ISO / IEC 17020, ISO/IEC 17021, ISO/IEC 17024, and IN 45011. The HellasCert's members are approximately 40 certification bodies; a few are currently accredited according to the ISO/IEC 17024. However, almost none of them has till now extended its scope of accreditation to professions related to the EE and RES sector.

6.2.5 LLL Training providers

The different training providers being part of the National Network for LLL are:

- Vocational Training Institutes (IEK);
- KDVM Level II Centres (former KEKs);
- Post-secondary centres and Freel Studies Workshops (EES), hereafter under Law 4093/2012, Centres for Lifelong Learning Level I (KDVM I);
- Other public and private vocational schools;
- Institute for Youth and Lifelong Learning (INEDIVIM);
- Providers of services of formal and non-formal adult education, including social, religious and cultural institutions and structures providing adult education services, such as the Second Chance Schools (SDE) and the Schools for Parents;
- Providers of consulting or services of professional orientation;
- Employment Promotion Centres (KPA) in the part of providing Lifelong guidance and counselling;
- Bodies in the public and broader public sector who provide non-formal education in human resources in the public and broader public sector, such as National Centre for Public Administration and Local Government (EKKDA);
- Bodies set up by professional associations and chambers which provide non-formal education to their members;
- Providers of LLL which are constituted by the tertiary unions and employers align by national collective contract;
- Bodies of informal learning.

With regard to the building sector the involved training providers are mainly:

- Vocational Training Institutes (IEK);
- KDVM Level II Centres (former KEKs);
- Other public and private vocational schools;
- Bodies set up by professional associations and chambers which provide non-formal education to their members;
- Providers of LLL which are constituted by the tertiary unions and employers align by national collective contract;
- Bodies of informal learning.

Manpower Employment Organization (OAED)

Manpower Employment Organization (OAED) through its nationwide network of Vocational Training Centre (former KEKs), implements CVT aiming at:

- the integration of unemployed trainees in the labour market,
- the continuing training of employees,
- the implementation of European mobility programmes,
- counselling and guidance for enterprises and people,

- the provision of technical support for submitting proposals for European programmes.

CVT programmes supported by OAED are:
- Continuing vocational training courses for the unemployed
- Pilot vocational training courses for young people, who have abandoned the formal education system (early school leavers)
- Training courses for self-employed people (small family enterprises employing 1 to 5 persons), who require education or skills to meet the requirements of their occupations

6.2.6 Existing instruments to monitor market developments in terms of technologies, skills requirements and training / sector skills councils

National Institute of Labour and Human Resources (EIEAD)[68]

The National Institute of Labour and Human Resources (EIEAD) is supervised by the Ministry of Labour, Social Security and Social Welfare. Its aims, according to L.3996/2011, are:

- collection and processing of statistical data relevant to the labour market, employee relations and employment policies etc.;
- the preparation and adoption of the National Annual Report on Labour Market and Employment in Greece;
- the promotion of vocational training and lifelong learning for the workforce of the country in terms of national employment policies;
- the development of tools for the implementation and promotion of continuing vocational training and lifelong learning;
- the planning and execution of training and retraining actions of the workforce as well as the implementation of specific training programs for socially vulnerable groups, in line with current legislation on Vocational Training and Lifelong Learning.

Observatory of Economic and Social Developments[69]

The Observatory of Economic and Social Developments is part of the Labour Institute of Hellenic General Confederation of Workers (INE-GSEE) and is targeted to workers in all areas of profession: academic community, policy makers and eventually all citizens. It provides scientifically based analysis for a range of social and economic issues directly related to the interests of the workers in coherence with the current situation.

Hellenic Confederation of Professionals, Craftsmen & Merchants (GSEVEE)[70]

The Hellenic Confederation of Professionals, Craftsmen & Merchants (GSEVEE), founded at 1919, is a third level, cross-sectoral, employer's organisation across Greece, and one of the major social partners that co-sign the National General Collective Agreement (GSEE, GSEVEE, ESEE, SEV). It constitutes the major and most massive association of Professionals, Craftsmen and Merchants all over the country.

Foundation for Economic & Industrial Research (IOBE)[71]

[68] http://www.eiead.gr/index.php?option=com_content&view=article&id=160&Itemid=142&lang=el
[69] http://www.ineobservatory.gr/
[70] http://www.gsevee.gr/index.php?option=com_content&view=article&id=225&Itemid=347
[71] http://www.iobe.gr/index.asp?a_id=122

The Foundation for Economic & Industrial Research (IOBE), established at 1975 as a private, non-profit, public-benefit research organisation. IOBE researches on current problems and prospects of the Greek economy and its sectors and provide analysis and proposals for action to policy makers in the context of economic policy making. It seeks to identify, at an early stage, economic issues that can become crucial in the future and to propose timely solutions for these. IOBE is enjoined by its statures to perform the following functions:

- To carry out applied research on basic structural and sectoral problems of the Greek economy
- To monitor and analyse short-term economic trends, to record the business climate, and to prepare forecasts and evaluate prospects of the Greek economy.
- To provide reliable and continuously updated economic information about particular sectors of the Greek economy.
- To cooperate with foreign research institutions and international organisations on matters of common interest and to conduct multi-country research projects on economic issues and policies.
- To contribute to the public debate on economic issues.

6.3 Data on courses provided by craft/profession

6.3.1 Courses of CVET provided by KDVM Level II Centres

The LLL Training Centres (KDVM Level II) under the GSLLL provide educational services in the sector of CVET.[72] The purpose of KDVM Level II Centres is to improve and strengthen the employment status of employees and to help the unemployed to enter the job market. The GSLLL KEK KDVM Level II programmes are offered to the unemployed, employees, as well as vulnerable social groups. Currently there are several seminars provided by GSLLL KDVM Level II for engineers (TEI) working in the field of EE in buildings.

Training including EE and RES, offered to the building sector's workforce, mainly refer to the following subjects:

- Environmental Professions
- Technical Professions and Professions in Transport

Table 6.7: Training programmes provided by GSLLL KDVM Level II (building sector)[73]

Training Programmes	Duration
Building Energy Inspectors	60 hrs (+28 hrs optional courses)
Inspectors of boilers and heating installations	30 hrs (+2 hrs optional courses)
Inspectors of Air-Conditioning Installations	30 hrs (+22 hrs optional courses)
Integrated Training Program «Building Energy Inspectors - boilers and heating installations - Air-Conditioning Installations»	120 hrs (+70 hrs optional courses)

Programmes available for the building sector's technicians are limited and not provided in a regular base. Most of them are one or two day seminars organized by relevant associations in collaboration with a KDVM Level II Centre. In several cases, the seminars offered do not focus to one target group but are open to a wider audience with different specializations and

[72] Organisation of the education system in Greece 2009-2010, European Commission, Eurybase Greece
[73] http://www.kekgsevee.gr/

no specific entry requirements. Indicative seminars that were available by KDVM Level II Centres operated by various "social partners" in the last two (2) years or they are currently available are presented in Annex III.

6.3.2 Vocational training by certified KDVM LEVEL II Centres in sustainable environmental management (green jobs) for unemployed people

There are some funding schemes for CVET In the field of EE and RES. One of them is the vocational training in sustainable environmental management (green jobs)[74] for the unemployed with mandatory post-training employment, by certified KDVM LEVEL II Centres which was funded by the OP "Human Resources Development" in the framework of NSRF 2007-2013. The programme's implementation is from 09/2011 to 03/2013, with 7500 potential beneficiaries.

The courses are referred to skills related to sustainable environmental management, the so-called "green jobs". The specialties which are related to RES and EE are: Sector of bioclimatic design, environmentally friendly homes, sustainable buildings and sustainable energy production. The duration of the training programmes varies from 400 to 800 hours, where besides the theoretical training, it is also included "on-the-job training experience" for the trainees in collaborating enterprises, companies and institutions of the private sector which are associated with the training courses and are located in the same or in different prefecture within the same region.

Mandatory employment of at least 30% of the trainees who had participated in the training in work places relative to the course for at least 3 months and at least 70 working days wage, within a period of 30 working days from the completion of the programme, is foreseen. The number of trainees in each training programme is at least 10 and less than 25. The table below shows the regional distribution of green jobs of the project (by number of trainees) related to EE and RES.

Table 6.8: "Green Jobs" trainings offered related to EE and RES[75]

Specializations per region	Number of trainees
Eastern Macedonia –Thrace	
Workers for EE constructions	75
Green building Technician	50
EE, sustainable management and operation technical works, buildings and other activities	50
Central Macedonia	
Workers for EE constructions	125
Western Macedonia	
-	-
Epirus	
Workers for EE constructions	75
Green building technician	25
EE, sustainable management and operation technical works, buildings and other activities	50
Western Greece	
Workers for EE constructions	75
Rehabilitation and maintenance Technicians of "sick building"	25
Training of unemployed technicians in traditional building techniques	50
Thessaly	
Workers for EE constructions	50
Green building technician	25

[74] http://www.eye-ekt.gr/%28S%28pgpfnc45zeyyr0zid4khdd55%29%29/eye/StaticPage.aspx?pagenb=52046&lang =en-US

[75] http://www.eye-ekt.gr/%28S%28xflfbl55w05qri55wpxegh45%29%29/eye/StaticPage.aspx?pagenb=52000

Natural Gas technicians (RES)	50
Ionian Islands	
-	-
Attica	
Workers for EE constructions	170
Green building technician	50
Natural Gas technicians (RES)	74
Central Greece	
Workers for EE constructions	25
Building construction according to environmental standards	24
Peloponnesus	
Workers for EE constructions	125
Green building Technician	25
Aegean Islands	
-	-
Crete	
Workers for EE constructions	25

6.3.3 Extent to which the current system already addresses skills of VET graduates for implementation of EE and RES measures in buildings

The majority of courses (CVET) offered are not targeted to RES and EE in the building sector, they are very short (1-2 day courses) and may have gaps in relation to relevant skills and knowledge (see Table 6.6).

New skills are required including skills on new technologies/equipment for installing RES on site. Most of the recent courses offered in the RES and EE sector were related to PV installations as there was a boom in the Greek market the latest years. However, even the number of PV training courses is low and partially addressing to the technicians specific training needs, compared to the market growth and corresponding need for skilled installers.

Based on a fieldwork research, in the frame of PVTRIN project[76] concerning the training and certification of PV installers in Greece, one of the most important measures for the quality improvement of PV installations on buildings is considered to be the technical training of installers. However, the majority of the responders recognized that there are a few or almost none opportunities for appropriate technical training for the PV installers in Greece (target audience was distributors, authorized dealers, wholesalers, engineers, technicians and building constructors, professional associations, other actors engaged in PV installation).[77]

In addition, there is no “special” certification scheme for RES and EE installers in place. The majority of courses offered are not officially certified by a credible authority or a certification body. Vocational training in “Green Jobs” is a step towards the right direction, however the number of technicians to be trained, in this frame, is very limited (approx. 1200 all around Greece). In several Greek Regions these courses are not available at all. Even though, there are several options to become a technician (in professionals related to the building sector) through EPAL, EPAS and IEK, in the majority of the courses specific lessons on EE or RES are missing.

In addition, the limited number of occupational profiles related to EE and RES in the building sector (only 4% of the certified profiles) and/or the outdated or missing information regarding the “green skills” areas related to the energy efficiency policy is currently a drawback for the development of skilled building workforce. To enhance the above comment, the NQP

[76] http://www.pvtrin.eu
[77] T. Tsoutsos, S. Tournaki, Z. Gkouskos, E. Despotou, G. Masson. *Training and certification of PV installers in Europe*, Renewable Energy xxx (2012), in press

members and the involving stakeholders have also provided the same picture regarding the lack of suitable CVET on EE and RES in the building sector. In the survey within the framework of BUS-GR project, 30 NQP members were participated in.

According to the results of this survey:

- regarding the evaluation of the initiative to create a platform for Qualifications of workers in the construction industry in subjects related to EE and RES in Greece, 72% of the participants identified as necessary initiative, recognizing the void of certification and training that currently exists in the country for the workforce of technicians / installers RES and EE in the building sector. An additional 28% described the initiative as very useful, while no one described the action as less useful or indifferent. This finding is extremely important because it demonstrates that technicians / installers recognize the problem that exists in their sectors.
- In the question if the qualifications of the existing workforce of the building sector can meet the market needs, 96% of the participants considered this below satisfactory levels.
- With regard to the level of CVET related to EE and RES in the building sector, 40% of the participants in the survey graded as partially satisfactory, 56% as less satisfactory and only 4% as satisfactory.

6.4 Courses and training schemes on energy efficiency and renewable energies in buildings

In Greece there are several training courses which include topics with regard to EE and RES technologies. However, most of the courses are not clearly addressed to technicians, electricians plumbers etc. as there are no specific entry requirements and usually they are attended by people interested in the RES and EE sector; thus not offering adequate knowledge or skills. Participants of these training courses are not accredited by a credible authority or a certification body.

There are also training courses offered by trade and industry associations, professional chambers, wholesalers and producers (only related to specific products). In most cases, these are ad-hoc, short term (1-2 days) seminars. Training courses offered by the professional associations are more tailor-made to the needs of their members, therefore those courses are covering part of the skills required in specific areas related to EE and RES.

Information provided by trade associations/ professional federations is as follows:

- **Greek National Federation of Electrical Contractors (POSEH):** POSEH has 9000 licensed members. During 2009-2011, 1052 members of POSEH have been trained to RES subjects:
  - **Introduction to RES**: Renewable energy basics (solar thermal, solar electric, wind, wave, geothermal)
  - **Categories of RES power systems**: Isolated auto-producers, small scale producers, isolated scale (micro grid), cross-linked derivatives, Photovoltaic effect, photovoltaic cells (types) Photovoltaic panels Photovoltaic Arrays, Photovoltaic Panels Specifications, Calculation of energy needs housing size installed power
  - **Dimensioning Autonomous System**: Calculation autonomous system and all its components (energy needs, power inverter, batteries, charge controllers, installed power output with renewable energy), Hybrid systems Calculating energy needs housing size installed power

- **Information on autonomous system installation**: Pipelines of electricity, charge controllers, energy storage (batteries, producing H_2, lifting water, heating water). Integrated charging systems parallelism and reversal effect
- **Wind Energy**: Experimental implementation of a complete autonomous system, low power wind turbines for domestic use, turbine basics (rotor, generator, system orientation, survival kit)

- **Greek Electricians Federation:** According to the federation information, there are about 60.000 licensed members. Although there is a strong demand from the members for training seminars in RES, the federations has not yet implement any.

- **Greek Federation of Building workers and related professions:** Before 2005 there were over 200,000 enlisted members in the federation. In January 2012, according to ELSTAT, the number of workers in the building sector has fallen to 39.500 people. Seminars in RES are not recorded so far.

- **Greek Federation of cooling technicians:** No seminars in RES are recorded.

A number of indicative seminars for EE and RES training provided the last year(s) by private organizations are presented in the table of Annex IV.

KDVM Level II Centre of St. Anargiri: CVET focused to EE and RES

The KDVM Level II Centre of St. Anargiri (Attiki Region) offers courses focused on EE and RES. The training program "Renewable Energy Sources Systems Development" - 660 hours training - was implemented during 2011-2012, including the following topics:

- "Wind Turbine Installations & Photovoltaic Systems", 180 hours
- "Energy Conservation in Buildings and Industrial Properties", 180 hours
- "Domestic Gas Installations", 140 hours
- "Solar Heating Systems - Cooling", 160 hours

The course was attended by 71 graduates of technical secondary or higher education, who received attendance certificates after the successful completion of an assessment process. The DVM Level II Centre of St. Anargiri is funded by GSLLL (75%) and by the municipality of St. Anargiri (25%).

6.5 Relevant initiatives at national /regional level supported by the EU

In this section, national and regional initiatives with regard to training and qualifications of the building workforce related to EE and RES supported by the EU are presented.

6.5.1 Leonardo da Vinci projects related to EE and RES, in Greece

The following table presents related projects funded by the Leonardo da Vinci (LdV) Programme that have been implemented in Greece (Greek coordinators).[78]

YEAR	1996
PROJECT	Training Software Material in the Field of Solar Thermal Systems

[78] http://ec.europa.eu/education/leonardo-da-vinci/databases_en.htm

CONTRACT No	GR/96/2/1415/PI/II.1.1.a/CONT
CONTRACTOR	GSIA - GREEK SOLAR INDUSTRIES ASSOCIATION
DESCRIPTION	The objective was to develop high-quality training which enables employees to keep up technological change. The project developed electronic educational material to complement the training of SME professionals and trainees in the sector. This task was assisted by studies to identify the training needs of SME staff and trainees at vocational schools. The multimedia electronic training tool developed was appropriate for use both at work and at vocational training schools; also suitable for professionals working in sectors other than the solar thermal system sector.
PRODUCTS	Training modules, Distance training, Computer/electronic-based materials
TARGET GROUPS	Workers in companies, Training experts, Students

YEAR	**1997**
PROJECT	BUILD ENV - Buildings and Environment : new Skills in the Field of Construction
CONTRACT No	EL/97/2/00328/PI/II.1.1.a/CONT
CONTRACTOR	VALTER FISSAMBER AND ASSOCIATES LTD. - VFA LTD
DESCRIPTION	This project aimed to develop and test an innovative training programme to equip personnel of the construction sector with knowledge and skills in environmental issues, and the design and construction of buildings. The training programmes, comprised of five independent modules, focused on building design, building renovation, energy efficient buildings and new buildings. Materials developed for trainers and trainees included training instructions, guidelines, background information and a guide for support activities. Testing followed by the preparation of an English version training to give European-wide publicity and later a multimedia application plus training package was developed.
PRODUCTS	Training programmes/curriculum, Training modules, Group training with tutor
TARGET GROUPS	Young graduates, Trainers, designers and managers of training programmes, Workers in companies

YEAR	**1999**
PROJECT	TREE - Training of trainers in environmental education
CONTRACT No	EL/99/1/068232/PI/I.1.1.a/FPC
CONTRACTOR	MUNICIPAL DEVELOPMENT AGENCY OF ORCHOMENOS
DESCRIPTION	This project aimed to widen the scope of environmental education as a means to promoting a new environmental culture, through the development of training materials and curricula for secondary school teachers, with a focus on built environment issues. Partners reviewed environmental education provision in partner countries and, from selected case studies, design and develop curricula and training materials. Seminars was organised in each partner country for evaluating methodology and the resulting training packages. Outcomes included partner country reports, training curricula, and CD-Rom training packages, with accompanying texts, photos, slides and videotapes.
PRODUCTS	N/A
TARGET GROUPS	N/A

YEAR	**1999**
PROJECT	SOLWIN - Vocational training for electricians in solar and wind energy systems
CONTRACT No	EL/99/1/068251/PI/I.1.1.b/FPC

CONTRACTOR	**SIVITANIDIOS VOCATIONAL PUBLIC SCHOOL**
DESCRIPTION	**The project aimed to meet the need for electricians specialised in the installation and maintenance of electrical devices in solar and wind energy systems, through the development of internet-based electrology training programmes, focusing on electrology in general, products, and technology. Partners developed an electronic learning environment for delivering training, and for providing access to other training support facilities. The training courses involved extensive use of internet chat, voice, video, and teleconferencing services. A major feature of the project is the creation of a network of partners in electrology, in order to provide a range of sector-related information services, and to promote knowledge transfer within the educational/industrial/scientific community.**
PRODUCTS	**N/A**
TARGET GROUPS	**N/A**

6.5.2 Other projects related to EE and RES supported by the EU

EARTH, Extend Accredited Renewables Training for Heating[79], IEE project

Aim/Target group

The EARTH project has developed training courses and training infrastructure for installers of three RE technologies for heat production: solar water heating (SWH) systems, ground-source heat pumps (GSHP), and biomass heating systems. Under EARTH, suitable training programmes were developed within the existing national vocational training frameworks in the relevant countries. Pilot courses were implemented to test the training programmes. In Greece two training courses have been pilot tested, namely one for the installers of GSHP and another one for the installers of biomass heating systems.

Training course's contents

Biomass domestic heating systems Training Course for Installers	Ground Source (Coupled) Heat Pump Training Course for Installers
Energy and the Environment – 1 hr	Environmental relevance – 1 hr
Marketing of the biomass domestic heating systems – 1 hr	GSHPs as investment – 1 hr
Characteristics and supply of biomass fuels – 1 hr	Marketing of GSHPs – 1 hr
Burning characteristics – 1 hr	Geology, climate and national regulations – 1 hr
Biomass fueled heating systems – 4 hrs	Heat sources – 1 hr
Installation of systems – 4 hrs	Technical details of the heat pump cycle – 2 hrs
Commissioning (theory & practice) – 1 hr	Operating modes and control – 1 hr
Health, Safety and Fire prevention issues – 1 hr	Heat distribution systems & hydraulic system integration – 2 hrs
Standards and Regulations – 1 hr	Electrical basics – 1 hr
Maintenance – Customer information and service – 1 hr	Conducting a site assessment – 1 hr
	Installation and commissioning (theory & practice) – 2hrs
	Customer hand over and warranty – Maintenance – 1 hr
	Common mistakes and practical experience – 1 hr

[79] http://www.earth-net.info/

National Coordination/Training provider: CRES, Centre for Renewable Energy Sources and Saving

Duration: 01/01/2005 - 31/12/2006

PVTRIN, Training of Photovoltaic Installers in Europe[80], IEE project

The PVTRIN initiative addresses the market needs for a qualified PV installer's workforce, through the development of a training and certification scheme for installers of small scale PV systems. The PVTRIN scheme incorporates the criteria set by the 2009/28/EC Directive for qualification schemes and certified training courses in each Member State, as well as the requirements of the national legislation.

PVTRIN training courses are addressed to qualified electricians, with relevant working experience, who wish to activate in PV installation and maintenance. Participants develop their skills and understanding of basic solar and electrical theory, systems components, design, installation, commissioning and troubleshooting of a small scale PV system including. The course consists of two parts, the theoretical and practical training, according to the following structure.

	MODULE	CLASS	LAB/SITE	SELF STUDY
		hours		
8 days class course duration 4 weeks	1. BASICS	4		6
	2. DESIGN PRINCIPLES	9	3	24
	3. BAPV AND BIPV	4		8
	4. INSTALLATION - SITEWORK	10	2	30
	5. MAINTENANCE AND TROUBLESHOOTING	3	2	8
	6. CASE STUDIES – BEST PRACTICES	3		14
	7. EXAMPLE INSTALLATION OF A SMALL SCALE PV ON BUILDING	4	7	12
	8. QUALITY MANAGEMENT AND CUSTOMER CARE	3		6
		40	14	108

The standard training is an 8-days program consisting of class lectures, exercises and hands-on training in demonstration facilities and laboratories. Participants are enabled to study online, to self-evaluate their progress and to get further training through the PVTRIN e-learning platform. To achieve certification, the PVTRIN trainee has to prove the required knowledge and skills by successfully completing the PVTRIN exams (written and practical part). Once the required areas of competencies are completed and the trainees have fulfilled the assessment requirements, they may be eligible for the PVTRIN Certification.

EU Project Coordinator/Training Provider in Greece: TUC, Technical University of Crete, Laboratory of Renewable & Sustainable Energy Systems

Duration: 01/06/2010 - 31/05/2013

[80] www.pvtrin.eu

Install+RES, Training for installers of small-scale RES systems in buildings[81], IEE project

The main objective of the "Install+RES" Project is set up training courses for trainers and for qualification of installers of RES systems like biomass, solar systems for DHW, photovoltaic and heat pump systems in European states like Bulgaria, Greece, Italy, Poland and Slovenia. This is implemented in compliance with the requirements of Directive 2009/28/EU. The expected result is qualification and certification of 48 installers of RES systems in each of the participating countries in the period 2011-2013 in three courses – one pilot course and two training courses.

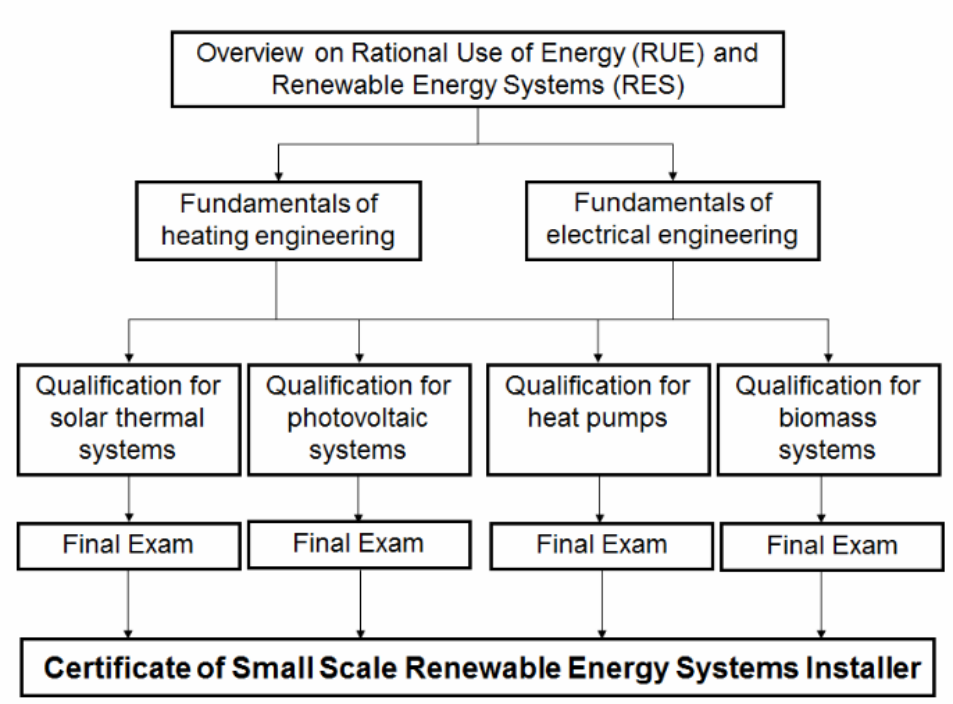


Figure 6.5: Installers – Course structure (Install+RES)

National Coordination/Training provider: CRES, Centre for Renewable Energy Sources and Saving

Duration: 01/06/2010 - 31/05/2013

AIDA, Affirmative Integrated Energy Design Action[82]

The AIDA project aims to accelerate the market entry of nearly zero-energy buildings (NZEB). This means energy efficient buildings and the use of renewable energy sources, which are both highlighted in the IEE 2011 work programme. The target groups of this proposal are primarily municipal representatives as well as architects and master-builders on the supply side. AIDA offers action tailored to suit each of these groups including study tours, operational success stories, presentation of existing tools, active support for municipalities and close cooperation with key actors.

[81] http://www.resinstaller.eu
[82] http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=2538

In the frame of this project training to building professionals on existing tools for integrated energy design and nearly zero-energy buildings will be provided. Training and experience was provided by consortium partners in other past European projects with partners from Greece. There is a large number of downloadable documents are freely available on the websites, including extensive reports on training programmes in Greece.

National Coordinator: CRES, Centre for Renewable Energy Sources and Saving

Duration: 01/06/2012 - 05/01/2015

SOLCO, Solar cooling technology across southern European islands[83]

Target Group

Engineers and technicians working in the field of building Air Conditioning.

Aim of the project

To increase awareness on relevant information concerning opportunities that can be offered by the utilisation of solar cooling technologies; to assess different solar technologies; to analyze the market barriers of both technologies, heating and cooling; and to develop training courses and material addressed to technical actors, involved in solar cooling and chilling systems, and to the hotels technical staff.

Six training courses were implemented in Greece during 2008 and 2009.

Training structure

- Solar Cooling /Basic Principles: 2 hrs
- Environmental Basics: 2 hrs
- Solar Collectors: 2 hrs
- Air Conditioning /Chillers: 2 hrs
- Design of a solar cooling system /Case studies: 2 hrs
- Building and air conditioning: 2 hrs
- Case studies: 2 hrs
- Simulation Practice: 4 hrs

Total: 18 hours

National coordination/Training provider: TUC, Technical University of Crete, Laboratory of Renewable & Sustainable Energy Systems

Duration: 01/01/2007 - 28/02/2009

EMTEU, Energy Management Technician in EU - pilot project[84], 'Leonardo da Vinci' Project

The aim of the EMTEU – "Energy Management Technician in EU" pilot project, was to develop common skills and training for renewable energy and energy management technicians in the EU. This professional profile will have skills in the following areas: Energy (conventional and alternative), Environment and sustained development, Bioclimatic Architecture, Centralised Control Systems The project involved training and qualifications organisations and institutes from various Member States (Spain, Germany, Greece, France, Belgium and Hungary) to design for skilled technicians in: the development of energy-saving

[83] http://www.solcoproject.net
[84] http://www.emteu.lstudi.cat/en/index.html

plans, the management of the efficient use of energy and water, energy certification of buildings, promotion of renewable energy facilities, optimization of human resources, complying with regulations and safety conditions. The training was framed in the same level of European Qualifications (EQF), permitting the direct transfer of training credits between countries (ECVET).

National Representation: Sivitanidios Public School of Trades & Vocations (CRES as subcontractor)

BEST RESULT, Building and Energy Systems and Technologies in Renewable Energy Sources Update and Linked Training[85], IEE project

Aim/Target group

The BEST RESULT project aimed to raise awareness and to enhance skills among key actors in the building and energy sector on the supply side (like installers, technicians, professionals, architects, planners, retailers etc.) with regard to RES. This was achieved through a range of training and information measures (specialization courses, info-desks, workshops, website, etc.). At the same time, the project contributed to boost also the demand side (i.e. end consumers) for small scale renewable applications (e.g. by means of guidelines, seminars, publications, website, etc.). The project activities were based on a thorough analysis of barriers to the deployment of small-scale renewables appliances (e.g. surveys and studies).

Structure of the training course

The project partners are sharing a common methodology, which however is adapted to the specific regional/local needs and conditions.

- Review of the RES and the principles of operation: 1 hr
- The present market situation of RES and potential for applications at local and European level - Strategies and opportunities marketing: 1 hr
- Best technologies and "best practices" in designing systems RES small-scale buildings - Installation and maintenance of systems (10 hrs)
  - *Solar Thermal Systems (STS): 2 hrs*
  - *PV Systems (PV): 2 hrs*
  - *Biomass Systems: 2 hrs*
  - *Geothermal Heat Pumps (GSHP): 2 hrs*
  - *Small wind turbines: 1 hrs*
  - *Hybrid systems (Combi): 1 hrs*
- Key issues related to RES in buildings (incorporating RES in buildings, efficiency of materials and manufacturing processes buildings, energy consumption and savings, etc: 3 hrs
- Techno-economic analysis of a deployment of renewable energy: 2hrs
- Funding opportunities and ways of supporting applications RES in buildings: 1 hr
- Examples of successful applications, analysis of problems encountered, solutions found, or Practice (in laboratories: 3 hrs

  Total: 21 hours

National Coordination/Training Provider: CRES, Centre for Renewable Energy Sources and Saving

Duration: 01/01/2006 - 31/12/2008

[85] http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1448

VENT DISCOURSE, Development of Distance Learning Vocational Training Material for the Promotion of Best Practice Ventilation Energy Performance in Buildings[86], IEE project

Aim/Target group

Vent DisCourse adopted the distance learning method and applied it to ventilation - a core area of the energy performance of buildings. It targeted building professionals in an effort to stimulate the use of best practices in ventilation and addressed non-technological and cultural barriers via pilot training courses and awareness rising.

Training course's contents

- Principles of energy efficient building
- Natural and hybrid ventilation
- Ventilation for urban buildings
- Energy efficient mechanical ventilation
- Assessment of building ventilation
- Computerized Tools and Case-studies

National Coordination/Training provider: National and Kapodistrian University of Athens (NKUA)

Duration: 01/01/2005 - 31/12/2006

Qualicert: "Common quality certification and accreditation for installers of small-scale renewable energy systems"[87], IEE project

The QualiCert project has contributed to the development of a **European set of common "key success criteria"** for certification or equivalent qualification schemes for installers of building-integrated biomass stoves and boilers, shallow geothermal energy systems, heat pumps, photovoltaics and solar thermal systems so that they can be mutually recognizable. The project addressed to the Directive 2009/28/EC requirements. As a part of its activities, Qualicert released a manual for the implementation of specific accreditation schemes for training courses and for the certification procedures. This included the key success criteria for setting up a certification/qualification scheme identified through a consultation process including validation workshops in 8 countries (key stakeholder groups in national level are involved) and a High Level Steering Group (HLSG) of more than 30 major experts in the fields of renewables and certification (from Austria, Belgium, Bulgaria, Cyprus, Denmark, Finland France, Germany, Greece, Italy, Luxembourg, the Netherlands, Poland, Portugal, Romania, Slovenia, Spain, Sweden, and the UK).

National Coordination: CRES, Centre for Renewable Energy Sources and Saving

Duration: July 2009 -December 2011

[86] http://eaci-projects.eu/iee/page/Page.jsp?op=project_detail&prid=1765
[87] http://www.qualicert-project.eu/

7. Skills gaps between the current situation and the needs for 2020

7.1 Introduction - National targets for 2020

The national objectives for 2020 concerning EE and the integration of RES in the building stock are qualitatively summarized in the following:

1. Increased energy saving through energy efficiency measures in the building infrastructure of the country.
2. Penetration of the RES and new energy-saving technologies in the building stock of the country.
3. Increased number of skilled and unskilled workers entering the national construction sector.
4. Need for upgraded skills and continuing education of the construction workforce of the country on EE and RES in buildings.

Moreover, according to the National Energy Efficiency Action Plan (NEEAP)[88], the following quantifying figures derive:

- It is required to save around 3,142 GWh just for heating in the residential sector by 2016 (see Figure 7.1).

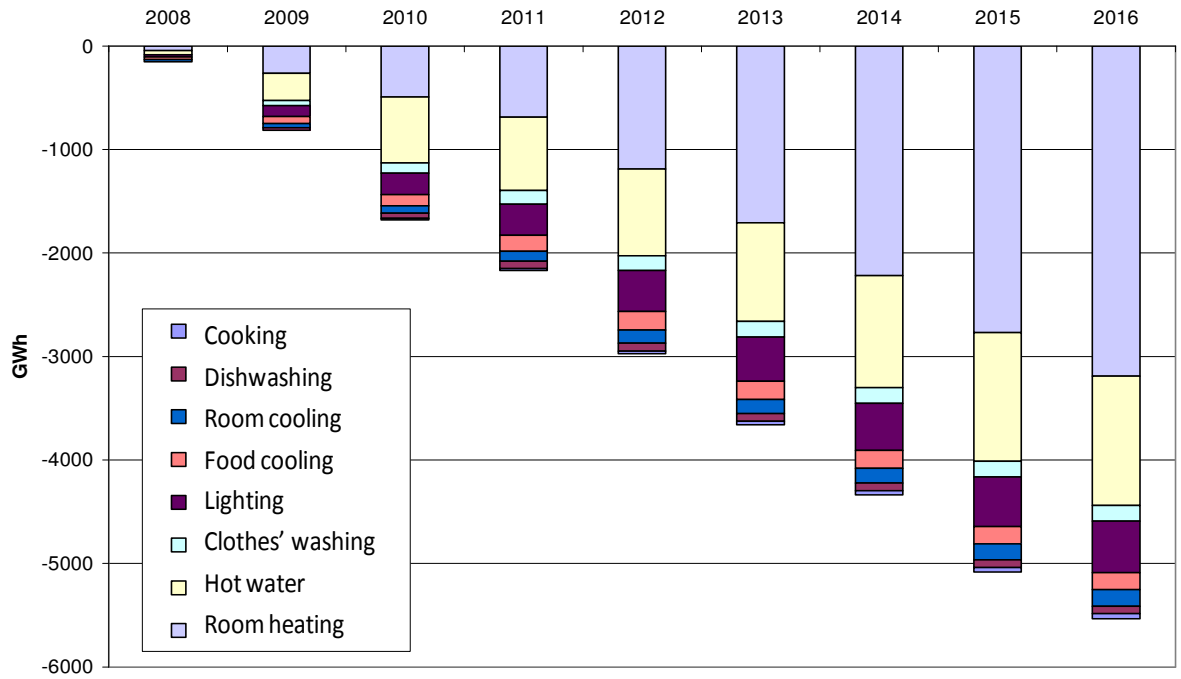


Figure 7.1: Energy saving by activity category in the residential sector until 2016[88]

- It is required to save around 3,369 GWh on heating and 862 GWh on air conditioning in the tertiary sector until 2016 (see Figure 7.2).

[88] National Energy Efficiency Action Plan (NEEAP), in the frame of the Directive 2006/32/EC, Ministry of Development, Athens, June 2008.

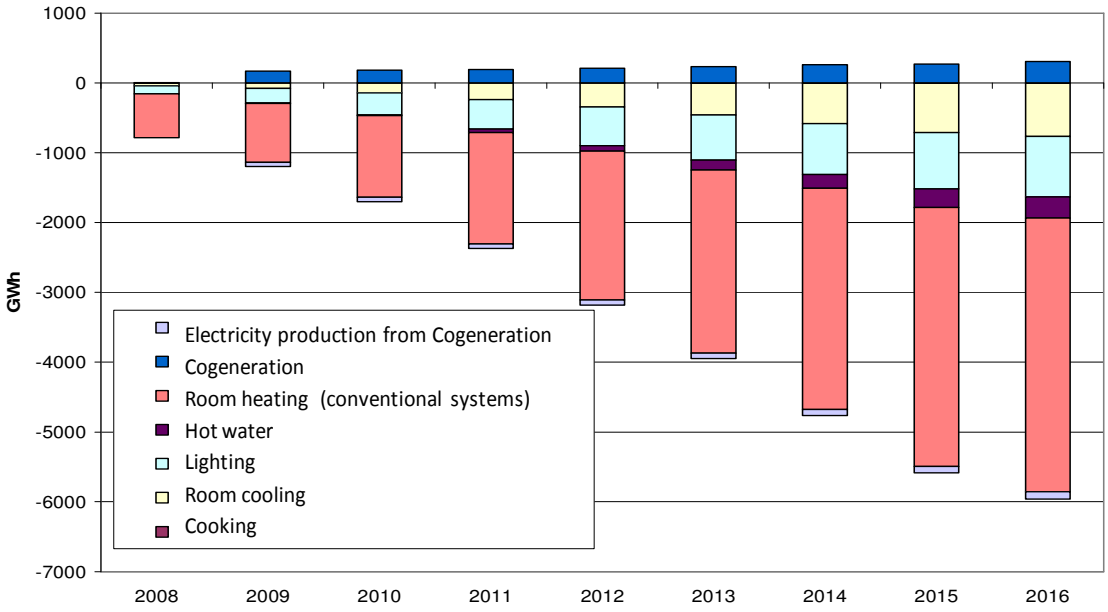


Figure 7.2: Energy saving by activity category in the tertiary sector by 2016[88]

Further quantitative data retrieved from the aforementioned NEEAP are:

- Saving of **5.5 TWh** is required from the residential sector by 2016.
- Saving **5.7 TWh** is required in the tertiary sector by 2016.
- The **GWh** required to be saved by 2016 are standardized by workforce (estimated number of workers and technicians of all specialties concerning BUS-GR).

Then, in section 7.2 an estimate of the evolution of the workforce in the construction industry until the end of the decade is presented. Specifically, in paragraph 7.2.1 the current situation is briefly analyzed while in paragraph 7.2.2 there is an estimation of the workers to be entering the sector and trained properly to serve its needs. The estimates to be presented based on available studies from various relevant Greek institutions and the above data in the report "Building the Future, 2011".

In section 7.3 the existing vocational education in Greece is presented along with the problems, gaps and future needs. Then, in section 7.4, the skills gaps observed in the workforce in the construction sector are described, together with the needs of acquiring new skills. Reference is also made to training centres and instructors that will be required to fulfil the educational goals and to the major issue of accreditation of new skills by the proposed National Qualification Platform (NQP).

7.2 Evolution of workforce: Quantitative assessment of the workforce needed to be trained

7.2.1 Present situation

According to the study "Interbranch Relations in the Greek economy," of the Labour Institute of GSEE - ADEDY[89], the construction sector belongs to the leading Greek sectors. It is one

[89] Athina Belegri-Roboli, Maria Markaki, Panayiotis Michaelides, *Interbranch Relationships in the Greek Economy. Production, Employment, Wages and Occupations*, Labour Institute of GSEE - ADEDY, December 2010, Athens (in Greek).

of the key sectors that comprehensively affect both production and employment, wages and endogenous growth of other professions, and other entire sectors of the economy (production and trade of building materials, insurance projects, other financial services, etc.).

Nevertheless, the Greek construction sector is experiencing continuous decline in activity that has taken unprecedented sizes due to the economic crisis. The construction and especially the building sector is in large and prolonged recession over the last few years. Specifically, the shrinking of the construction sector for which there exist related statistical data, has suffered shrinkage of around 80% since the beginning of 2006 until the end of 2012.[90]

The decrease in both new constructions / operations and workforce in the industry has already been presented in detail in Chapter 5 of this report. Representative figures are 5.8 and 5.12 of Chapter 5. According to the same data, more than two in five construction workers lost their jobs in the period from autumn 2008 to spring 2012 (from 398,800 to 218,900), while indicative of the problem is the fact that at the same time **50%** of the **young unemployed** in Greece come from the construction sector. Moreover, in the extensive area of construction materials, the domestic demand levels approach the levels of the 1980's with shrinkage of at least 30% and corresponding effects on employment levels.

According to the 6-monthly report of the SATE[91], and a recent report of Eurostat[92], the state of the construction sector, is constantly worsening, throwing heavily its "shadow" at the entire spectrum of the economy:

- 1 in 2 employees in constructions in 2008 is today outside the labour market. No other industry has suffered more, since in the remaking industry the ratio is 1 in 3 and in trade (wholesale and retail) 1 in 5. In total, since the beginning of the crisis 185,300 jobs have been lost.
- Private construction is now virtually nonexistent. For the seventh consecutive year there has been an impressive reduction. It is characteristic that the number of building permits in a six month period of 2012 reached the average monthly volume of 2005.

Specifically, according to the aforementioned report of SATE, during the second quarter of 2012, the decline in all dimensions continued and namely:

- The production index in constructions (all branches) shrinks for 14 quarters, thus the index is decreased by 29.8% compared to the second quarter of 2011, reaching its lowest level since 2000.
- The total employment in the sector has been shrinking for 16 consecutive quarters, showing further decrease of 18.6% compared to the second quarter of 2011.
- The involvement of the sector in GDP creation has been shrinking for 12 consecutive quarters, resulting in the minor contribution to the creation of the GDP, just 4.1%, decreased by 12% compared to the second quarter of 2011.

However, despite the very disappointing statistics, there is hope discerned by a large proportion of the technical world for a recovery of the sector. Specifically, energy efficiency in buildings can contribute to the environmental objectives of Greece and at the same time to be able to have an important opportunity for business growth in that crucial sector of the Greek economy.

[90] Hellenic Statistical Authority (ELSTAT), *Labour Force Survey*, March 2012.
[91] Association of Greek Contracting Companies, "*Developments in the Greek Construction Sector*" A|2012, Biannual Progress Report, Issue No. 7 - October 2012.
[92] Eurostat, *Labour market and the economic crisis*, 2012.

Institutional factors and the scientific community[93] absolutely converge in the position that energy efficiency in buildings is the most powerful lever for saving energy and reducing emissions of greenhouse gases along with a clear gain for society.

Greek buildings fail in their energy standards. The introduction of thermal insulation is the most effective way to improve this situation, despite the difficulties encountered in the implementation of the regulation. The building sector should therefore shift towards the renovation and reconstruction of the existing building stock, which apart from the social and environmental benefits will contribute in the replenishment of a large part of the jobs lost during the last years.

7.2.2 Future demand workforce in the construction industry

In this section it is provided a quantitative assessment of the workers and technicians to be required to enter the construction sector by 2020. In this way the country's obligations for energy upgrade of the existing building stock and construction of new buildings according to the new energy EE standards can be met. Greek labour force gap would result from the number of workers estimated by the following methodology, subtracting the **existing workforce** in the sector.

To assess this gap, the methodology was separated into two stages. In **Stage A** it is estimated the workforce required to enter the sector and be trained by the end of the decade in order to cover the needs for the energy upgrade of the existing buildings. These workers were categorized per building activity separately. On the other hand, during **Stage B**, it is estimated the number of workers who will be required to enter the construction sector as a whole in order to meet national building needs until 2020, under the EU energy standards.

Stage A: Interventions in the existing building stock to increase its energy efficiency

A review in the Greek literature has revealed three studies that approach the issue of the development of the workforce to meet the energy interventions in buildings until 2020. Each of these studies, with its own characteristics and its own data, is presented below and was taken into account in this report during the estimate of technicians and workers to enter the building sector until 2020.

The first study found in the literature was conducted by Greenpeace GR in 2009.[94] The basis for the calculations was a study for the Ministry of Development, which provides the energy upgrade of around 800,000 buildings by 2020, with an estimated budget of around 22.5 billion € (private and public investment). Given the fact that those interventions vary per building and every intervention has different effects on employment, the estimates were based on average data of large-scale programs that have been implemented in various countries.

According to the Apollo program in the U.S. (2008) for instance, the creation of a labour/year requires saving investments in buildings of 65,000 - 90,000 €. The German Ministry of Environment (2006) gives a different number, i.e. 40,000 € per labour/year. Based on the above data, jobs (new and preserved ones in the under crisis construction sector) that were calculated in this report are outlined in the chart below.

[93] http://www.capital.gr/news.asp?id=1675450
[94] Greenpeace GR, «Green Development and new jobs», (in Greek) retrieved online from www.greenpeace.gr, May 2009.

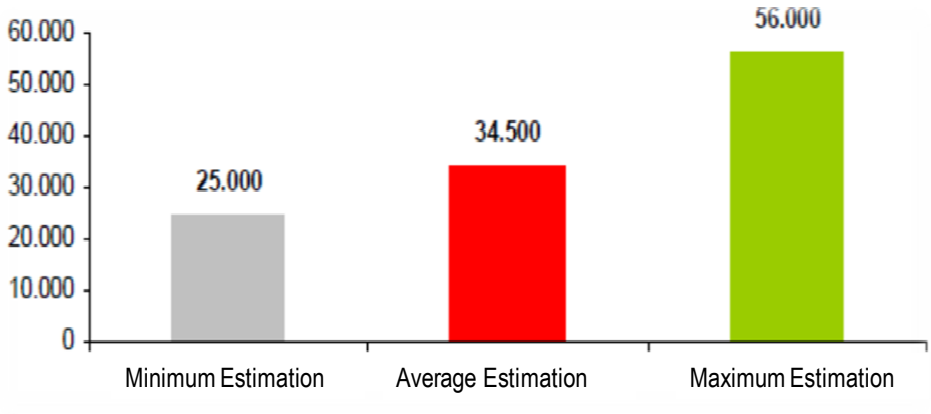


Figure 7.3: Full-time jobs to save energy in buildings until 2020[94]

Another study, entitled "Saving energy in buildings: Creating new economically viable jobs" (March 2010)[95], approached the number of viable technical jobs that can be created each year through energy efficiency interventions in the existing building stock. The report concluded that it is possible to generate from **10,500 to 12,000 jobs a year** just by saving energy in building stock through the introduction of technologies saving oil and electricity. The study reached these numbers upon assumption that the added value of the technical work (engineers and technicians) is worth 50% the value of EE investments in buildings.

Finally, a study of WWF Hellas conducted in collaboration with the Economic University of Athens[96], focused on the costs and benefits from nine specific EE interventions that can be applied in the building sector of Greece. It calculated that the implementation of these interventions will require significant financial resources that will reach a total of almost € 16 billion for the period 2010-2020 (of which € 12.4 billion for the residential sector). Then, based on a study of the British Association, which used data from 44 investment programs to improve energy efficiency in 9 European countries, including Greece, whereby for every € 1 million invested in EE measures generated 11.3 to 13.5 full-time jobs (they concern mainly transportation and installation of new efficient materials and devices, management positions, and research and development jobs), estimated that the implementation of these measures will create approximately **180,471-215,606 jobs** in Greece.

The approach proposed at this point, in order to ensure compatibility with the expressed policies in the field, focuses on the elements of the first NEEAP to achieve 9% reduction in final energy consumption by 2016. Note that up to this moment, there are no clear and definite goals from the Greek state for 2020. One sole commitment exists in the program "Building the Future"[97], by the number of planned interventions therein. Therefore, the calculations for estimating the required manpower are based on the commitments of the first NEEAP in 2016. On the other hand, the respective calculations for 2020 are based on the required number of interventions and the aforementioned commitment for 2020.

Estimation of required number of technicians in EE technologies in the residential and tertiary sectors

Initially, the required number of technicians needed in the **residential sector** is determined.

[95] Efthimiadis Apostolos, «Energy Conservation in Buildings: Creation of new, economically viable jobs», TCG Conference "Energy: Current Picture – Planning – Prospects", Athens, March 2010. (in Greek)
[96] WWF Greece – Athens University of Economics & Business, «Green measures in Greece: benefit/cost assessment of implementing specific actions to promote renewable energy and energy conservation». Scientific report, Athens: June 2010. (in Greek)
[97] «Building the Future, An Action for Sustainable Buildings and Green Development», Centre for Renewable Energy Sources and Saving (CRES), 2011. (in Greek)

According to the first NEEAP, the target for energy saving through heating in the residential sector is 3,142 GWh. According to the action plan, about 60% energy savings from heating by 2016 should have resulted from actions improving the housing (insulation, renovation of windows and doors, etc.). Further data on the expected penetration of EE technologies in the residential buildings of the country were extracted from the findings of the project "Building the Future", and more specifically from the diagram in Figure 7.4 below.

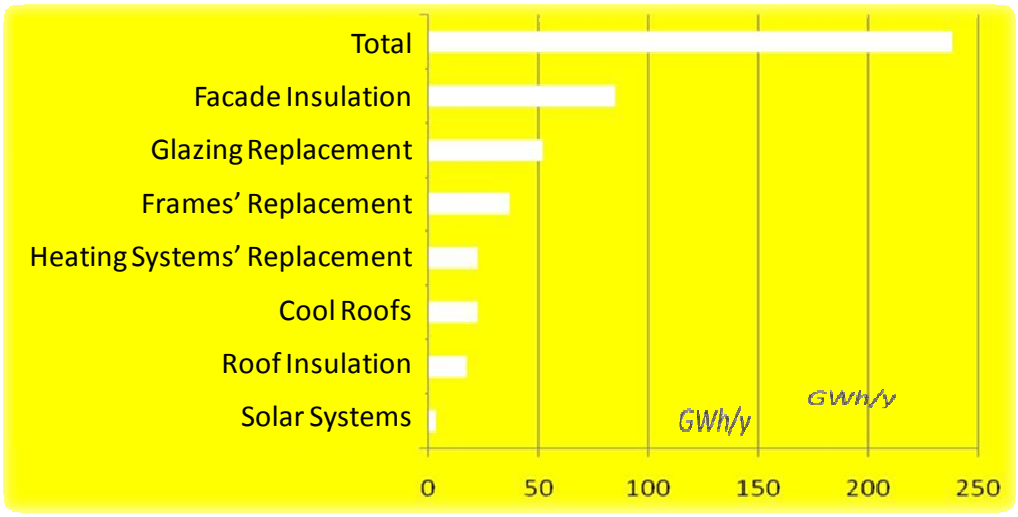


Figure 7.4: Graph quantifying the expected reconstruction works buildings, saving energy in units per year[97]

This chart refers to 130,000 interventions in households in order to save 230 GWh. The present approach does not exploit these exact figures, but the penetration percentage (%) of each energy-efficiency technology by 2016. Based on the above findings, the expected energy savings for each technology by 2016 are illustrated in Table 7.1.

Table 7.1: Expected savings per technology (GWh) in the residential sector by 2016

Building Reconstruction Technologies	Energy Savings (GWh)
Frames/Glazing replacement	668.2
Walls insulation	1,115.7
Roof insulation	223.1
Heating systems' replacement	307.8
Total	**2,314.8**

The 2,007 GWh expected to be saved (excluding the replacing of heating systems) constitute the 63.8% of expected energy savings from heating through actions improving the building shell, and are consistent with the 60% prescribed in the first NEEAP.

EPU-NTUA conducted research to determine the average manpower requirements for the installation of the aforementioned energy saving technologies. Since no scientific studies exist determining the above data, they were extracted from websites of companies in the field, and in some cases from direct contact with craftsmen and their companies. Then, utilizing **the average time requirements in manpower for the installation of each technology per square meter or MWh**, as well as estimates of the resulting energy savings from each of these reconstruction works, the final estimate of the required number of technicians until 2016 was determined.

Furthermore, to achieve the extrapolation of these data to 2020 and the goals outlined in the Program "Building the Future", the exact number of interventions in buildings in 2016 was estimated. It should be noted that according to the 2nd NEEAP[98], some energy savings in these areas have already been achieved by 2011, but it difficult to quantify them and take them into consideration, as it is expected that the main factor that has decreased the energy consumption is the economic crisis. Therefore, to determine the required labour-years in the following table, it is assumed that zero energy savings have been achieved until 2012. Hence, the estimate of the labour-years corresponds to the maximum number of labourers.

Table 7.2: Estimation of required skilled workers by 2016 in the residential sector

Building Reconstruction Works	Employment Man years	Estimation of required craftsmen for the Period 2013-2016	Number of Actions
Glazing replacement	11,000	2,750	1,010,000
Walls insulation	43,800	10,950	617,900
Roof insulation	2,800	700	71,600
Heating systems' replacement	3,400	850	408,750
Total	**61,000**	**15,250**	**2,109,250**

Consequently, according to Table 7.2, achievement of the target of 9% in final energy consumption by 2016 will result in the simultaneous satisfaction of the goal of 2,100,000 interventions in 1,100,000 households, according to the Program "Building the Future". Therefore, it is considered that by 2020 no additional technicians are going to be required and that the existing workforce will be able to satisfy the additional goals for 2020 if the targets for 2016 are met on time.

Similarly to the residential sector, the required numbers of craftsmen needed for the interventions in the **tertiary sector** are presented as follows.

According to the 1st NEEAP, it is expected that 600 GWh are going to be saved in space heating from actions improving the building shell (insulation, glazing). Since no individual shareholding of each technology is defined in any national study, it is considered that the glazing replacement is involved by 40% in the accomplishment of the target, masonry thermal insulation by 50% and roof insulation by 10%. The specific quantitative objectives of the expected energy savings by 2016, through upgrade of the building shell, are presented in Table 7.3.

Table 7.3: Expected savings per technology (GWh) in the tertiary sector by 2016

Building Shell Improvement Technologies	Energy Savings (GWh)
Frames / Glazing Replacement	240.0
Facade Insulation	300.0
Roof Insulation	60.0
Total	**600.0**

[98] 2nd National Energy Efficiency Action Plan (NEEAP) 2008-2016, in the frame of Directive 2006/32/EC, Athens, September 2011.

To estimate the required labour-years, the number of labourers required and the number of building interventions in the tertiary sector, the same procedures as in the residential sector were followed. These findings are summarized in Table 7.4 here below.

Table 7.4: Estimation of required skilled craftsmen by 2016 in the tertiary sector

Building Reconstruction Works	Employment Man years	Estimation of required craftsmen for the Period 2013-2016	Number of Actions
Glazing Replacement	14,800	3,700	111,850
Facade Insulation	31,320	7,830	101,260
Roof Insulation	1,880	470	15,750
Total	**48,000**	**12,000**	**228,860**

Concerning the replacement of conventional heating systems, in the 1st NEEAP it is just stated that a significant penetration of natural gas systems and heat pumps is expected. As the exact target is not clearly specified for conventional systems, initially the target for heat pumps is determined. In accordance with the 1st Greek National Renewable Energy Action Plan (NREAP)[99] submitted to the EU, the following data on the penetration of heat pumps are extracted.

Table 7.5: Expected penetration of heat pumps (installed capacity in MW) by 2020

Heat Pump Type	2012	2013	2014	2015	2016	2017	2018	2019	2020
Air source heat pumps	452	568	766	1,206	1,531	1,728	1,891	1,960	2,656
Geothermal heat pumps	70	85	116	178	225	248	279	287	388

The EPU-NTUA team conducted a desk research analysis in order to identify the average requirements of human resources for the installation of each of the above-mentioned technologies, as well as average required installed capacity per square meter, in order to elaborate the following Tables 7.6 and 7.7.

Table 7.6: Expected penetration of heat pumps (installed capacity in MW) during the periods 2012-2016 and 2017-2020

Heat Pump Type	Number of Systems		Energy Savings (GWh)	
	2012-2016	*2017-2020*	*2012-2016*	*2017-2020*
Air source heat pumps	6,380	4,690	1,055	780
Geothermal heat pumps	3,460	2,500	253	185

Therefore, the total number of individual heating systems to be installed globally in the period 2012-2016 is **9,840 heat pumps**, which corresponds to a total of 1,480 labour-years, as well as another **7,190 heat pumps** (both geothermal and air-source technologies), corresponding to 1,075 labour-years during the period between 2017 and 2020. This is shown in Table 7.7 below.

[99] 1st National Renewable Energy Action Plan, in the scope of Directive 2009/28/EC (Athens, 2010): http://www.ypeka.gr/LinkClick.aspx?fileticket=CEYdUkQ719k%3d&tabid=37

Table 7.7: Number of annually required skilled craftsmen for the periods 2013-2016 and 2017-2020

Heat Pump Type	Man-years		Number of Annually Required Skilled Craftsmen	
	2012-2016	*2017-2020*	*2012-2016*	*2017-2020*
Air source heat pumps	1,280	930	320	232
Geothermal heat pumps	200	145	50	36

Consequently, if the individual target for 2016 concerning heat pumps penetration has been met, no additional technicians will be required during the period 2017-2020, to achieve the target of 2020.

With regard to conventional heating systems, **29,700 buildings** in the tertiary sector are required to make interventions, a fact that will result in saving about 1,340 GWh by 2016. 740 labour-years are required to achieve this goal during the period 2013-2016, corresponding to 185 technicians annually. The following Table concerning the tertiary sector is indicative.

Table 7.8: Estimated number of skilled technicians required in the tertiary sector by 2016

Building Reconstruction Works	Employment Man years	Estimated number of required technicians annually by 2016	Number of actions
Glazing Replacement	14,800	3,700	111,850
Facade insulation	31,320	7,830	101,260
Roof Insulation	1,880	470	15,750
Heat Pumps	1,480	370	9,840
Heating Systems' Replacement	740	185	29,700
Total	**50,220**	**12,555**	**268,400**

According to the Program "Building the Future" official presentation, 1,000,000 interventions should be implemented in 300,000 buildings of the tertiary sector by 2020. Furthermore, in accordance with the penetration percentages of each technology (see figure 7.4), about 550,000 of these interventions concern external insulation of buildings, update of glazing and replacement of heating systems. The rest of them concern lightning systems and energy management of buildings. Therefore, to achieve the target of 2020, the workforce required to cover the targets for 2016 is adequate for meeting the targets for 2020 too.

Estimation of required installers of solar collectors in the residential and tertiary sectors until 2020

To estimate the number of installers of solar collectors (thermal solar systems), similar approaches from field research on the **average time manpower requirements for the installation of technologies per square meter** were adopted. These approaches focused on the achievement of the energy savings targets of 1,298 GWh and 745 GWh in the residential and tertiary sectors respectively.

The energy savings in domestic hot water (DHW) stated above are considered under the 1st NREAP that arise in their vast majority from the penetration of solar panels in the existing buildings. According to it, the penetration of solar panels is expected to increase further

during the period 2017–2020[99], to achieve the national targets set for the final energy consumption. Consequently, the goal for 2020 is determined to the saving of 4,128 GWh.

Based on the foregoing, the estimated number of installers of solar panels required to enter the workforce annually until 2016 is **590 persons**. During the period 2017-2020, it is estimated that **15 installers** (new) are needed per year.

Estimation of required PV installers in the residential and tertiary sectors until 2020

According to the Ministerial Decision of 11.10.2010 of the Minister of YPEKA, the installed target capacity of PVs on roofs and in parks by 2016 and 2020 are 1,150 MW and 1,450 MW respectively. Utilizing data from the RES Service of the Ministry of Environment, Energy and Climatic Change ("*Licensing status of RES Projects until the end of September 2012*")[100], the number of PV systems to be installed on roofs is 20,510 (request for a connection offer and binding connection offer).

Utilization of average installation time and labour force requirements per PV system under 10 kWp, as derived from field research, resulted in a total of 210 PV installers needed annually for the following years. However, taking into account the RES target for 2020, and that the construction of PV parks exceeding 1 MW has been "frozen" temporarily, it is estimated that by 2020 approximately 500 installers will be required annually. This number of installers is considered as adequate to achieve the targets for 2020.

All the extracted data from the above analysis, concerning the trained workforce needed to enter the building sector to achieve the national energy targets for 2020 from EE interventions in the existing building stock, are gathered in Table 7.9.

Table 7.9: Expected employment technicians for building energy upgrades and installation of renewable energy systems for the period 2013-2020

Buildings' reconstruction and RES installation works	Need for skilled craftsmen annually till 2020
Glazing Replacement	6,450
Facade Insulation	18,780
Roof Insulation	1,170
Heating Systems' Replacement	1,405
Solar Collectors	605
PV Systems	500
Total	**28,910**

Stage B: Construction of new buildings

The estimation of the required workforce to enter the building sector that will meet the country's needs for construction of new energy sustainable buildings until 2020, requires a different approach from that adopted in the case of reconstruction of existing buildings. Initially, a forecast of construction activity in Greece until 2020 is carried out, to estimate in **Step B1** the workforce composing the construction sector as a whole, at the end of the decade. Then, in **Step B2**, it is estimated the total required number of technicians and workers directly involved in energy efficiency and RES systems installation in new buildings, to meet national energy goals for 2020.

[100] http://www.ypeka.gr/LinkClick.aspx?fileticket=MC79KpZykRk%3d&tabid=701&language=el-GR

The current crisis and the continuing decline of the construction sector and construction activity beyond any prediction consider imperative the simulation of some alternative scenarios predicting the future course of constructions in Greece. More specifically:

- The purpose of Step B is the verification of the predictions by one of the forecasting scenarios. It is considered important to model an optimistic and a pessimistic scenario that will limit with maximum and minimum bounds the actual construction activity until 2020.
- In addition, a neutral - moderate scenario is also created and is considered as more realistic and more likely to be validated prospectively.

The prediction model used for the construction of three development scenarios of the construction industry, considered **slightly increasing population data** for Greece until 2020, according to the study EUROPOP2008 "Regional Population Projection"[101] for the evolution of the population of Europe by 2030, published by Eurostat in 2010. Figure 7.5 quantifies by region the assessment of this small increase in the population of Greece until 2030.

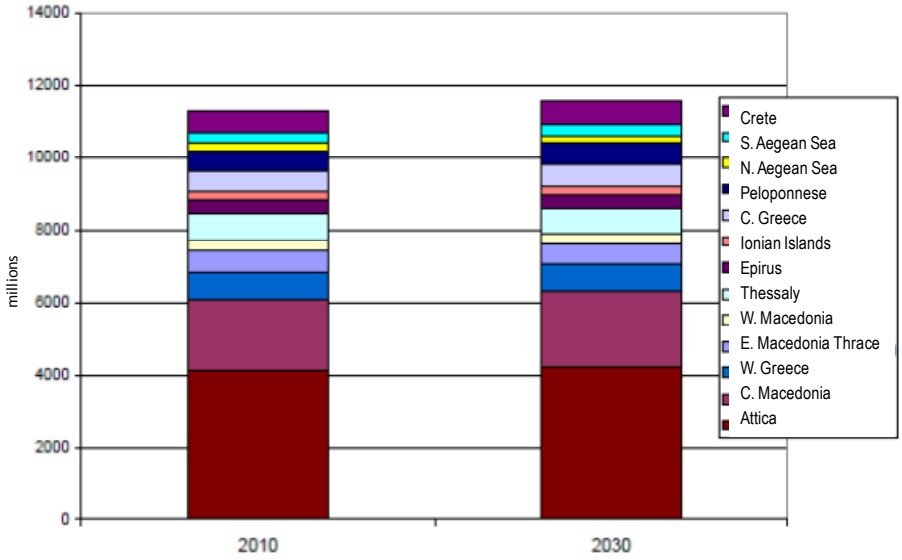


Figure 7.5: Estimation of population change by region of Greece[101]

This model also took into account the **continuous but milder miniaturization of the average size of the Greek household** (Economic and Social Council of Greece Report, 2009[102] - Figure 7.6 of the current report), data suggesting a continuous but diminishing need for construction of new homes. Furthermore, these estimates considered the data obtained from the study of the Bank of Greece[103] on the expected number of new houses by region of Greece in 2020.

On the other hand, the **prediction model** became **independent from economic and development data of the country**, such as GDP, because of the high volatility they exhibit in framework of the economic crisis prevailing in the country. In addition, construction activities and the construction industry in general, exhibit lower rates of GDP in recent years, as was presented in Chapter 5 of the report. Indeed, it is not excluded that the country's future

[101] Eurostat, "Regional population projections EUROPOP 2008: Most EU regions face older population profile in 2030", January 2010.
[102] Opinion of the Economic and Social Council of Greece, "The manufacturing and construction activity as components of economic development and the impact of economic crisis on them". October 2009. (in Greek)
[103] Committee for the Study of Climate Change Impacts (EMEKA), «The environmental, economic and social impacts of climate change in Greece», Bank of Greece, June 2011. (in Greek)

development and growth of GDP won't halt the continuing decline of the sector, due to the rotation of the Greek economy into other sectors.

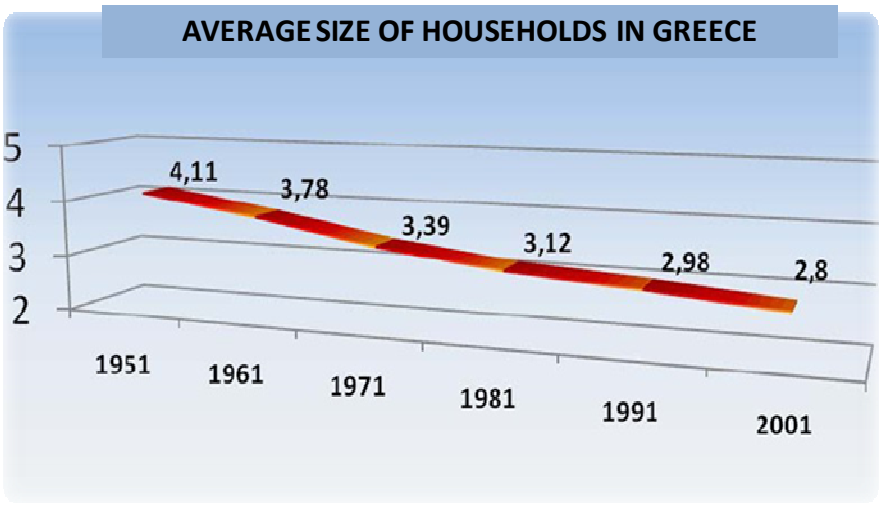


Figure 7.6: Graphical evolution average size of households in Greece[102]

Some additional important information and data that led the direction of the forecasting model are presented below:

- Past statistics show strong growth in the sector after steep declines. Moreover, there is no long stagnation, observed in the sector.
- European statistics put Greece as the country with the highest rates of home ownership than the other EU countries.
- Regions, such as Attica, that have concentrated great construction activity in the past, are considered as congested, with little potential for further reconstruction.
- There are thousands of unsold apartments and houses for years because of over-supply which could not be absorbed, a fact that prevents the construction of new households.
- In contrast, there is considerable room for growth in the tertiary sector, a fact that can lead to the reconstruction of a large volume of new buildings.
- The lack of liquidity in the Greek economy hampers the construction activity.
- According to official data (Report of the European Commission, December 2012[104], and a recent estimate of the Ministry of Development, January 2013[105]), Greece is expected to exit the crisis (recession) and return to growth in 2014, a fact which may favour positively the sector.

From all the above, the general conclusion derives that the construction sector in Greece is probably as low as possible and future growth is expected. However, the return to the high levels of previous years is expected at least after a decade, i.e. after the end of 2020.

The three scenarios simulated based on all the above data are detailed presented below and quantified in the graph in Figure 7.7 in units of new construction.

- **Optimistic scenario:** A small percentage decline until 2014 followed by a strong recovery and restoration of building activity in the country's 2009 levels.
- **Pessimistic scenario:** Continuous significant decline until 2014-15 followed by a subsequent period of stagnation until 2020.

[104] European Commission, European Economy, The Second Economic Adjustment Programme for Greece First Review - December 2012, Occasional Papers 123, December 2012.
[105] http://www.mindev.gov.gr/?p=9390

- **Neutral scenario:** Medium percentage decline until 2014-15 followed by a slight recovery and restore activity in the levels of 2010-2011.

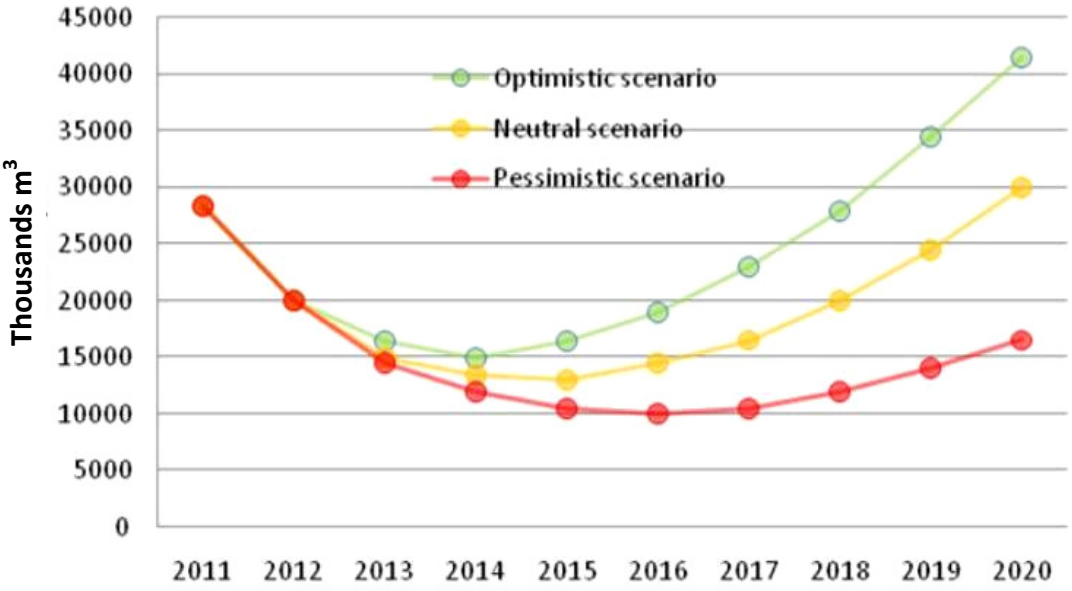


Figure 7.7: Simulation of three future scenarios of the evolution of total construction activity in Greece, in thousands cubic meters (EPU NTUA, 2012)

The statistics of each reference concern the period from September of the previous year to August of the reference year. Data for 2011 and 2012 were drawn from the databases of the National Statistical Service of Greece.

B1. Assessment of employees in the construction sector for the reconstruction needs of new buildings by 2020

The approach of the workforce to join the construction sector as a whole for 2020 was based on known numbers of workers and construction activity of earlier years. The size of this potential is largely proportional to the demand for reconstruction of buildings. Therefore, it was considered that this approach is the safest for the prediction of the future number of people employed in the sector in 2020. The results are exported based on the latest statistics, where the construction sector is composed of 205,000 people (see Chapter 5).

Analyzing the construction activity data and the number of employees in the construction sector for the years 2007 to 2012, the following results were exported for 2020:

- Optimistic scenario ⇒ 320,000 employees.
- Pessimistic scenario ⇒ 170,000 employees.
- Neutral scenario ⇒ 250,000 employees.

Briefly, for each scenario the following can be marked:

- The prevalence of the pessimistic prediction (or a similar one) shows that the number of workers in the construction sector will shrink even more than the current levels and so there is no need for labour in relation to the present situation.
- In contrast, the optimistic scenario and neutral advocate the development of the sector and the absorption of additional workforce compared with the existing one. More specifically, the prevalence of the optimistic or the neutral scenario of the current report or of a similar to those, imply the need of about 320,000 people and 250,000 people respectively.

- This means that in the case of prevalence of the optimistic scenario there will be a need to absorb 115,000 people in the construction sector, while in the case of the neutral scenario, 45,000 people will need to be absorbed respectively.

B2. Assessment of blue-collar workers to be needed for the construction of new buildings by 2020

The entire construction sector calculated above contains employees that are not related to this specific report, as engineers, office workers, business managers, drivers transport, etc. The jobs associated with tasks related to energy efficiency in buildings and the construction of energy autonomous buildings consist of the following categories:

Installations

- ***Electrical technicians - Electrical installations*** (solar panels, photovoltaic systems, sustainable lighting, power quality, electrical monitoring of buildings).
- ***Mechanical installations*** (heating systems, air conditioning systems, heat pumps, energy production (biomass - sun), ventilation, thermal monitoring of buildings).
- ***Roof technicians*** (solar panels, photovoltaic systems, wind energy).

Constructions

- ***Masons - Builders - Plasterers*** (insulation, protection from moisture).
- ***Carpenters*** (joinery energy efficient of floors, walls, roofs, windows, doors).
- ***Technicians of roofing*** (roofing insulation).
- ***Glaziers*** (installing glazing windows, doors and frames).

Specifically, the jobs of interest concern the professional classes 711, 712 and 741 at ISCO[106], as described in detail in Table 7.10, together with the absolute numbers of people who make up today. The data were obtained by ELSTAT and concern the third quarter of 2012. The last column of the table shows the annual influx of young people in particular occupations through career education system of Greece (VET).

It should be noted that further distinguish of the number of employees per four-digit-occupation category according to ISCO is not provided by ELSTAT. Especially for the category of builders and related occupations (711), it is not practically feasible to find the four-digit number per category. This is because of the fact that those professions do not require any type of training or qualifications and so workers can execute more than one of them, if there is a need in the building. An additional element preventing the above is the lack of jobs and the increased unemployment, due to the collapse of the Greek building sector, pushing many people in the broader category of masons to exercise other occupations to earn their living.

On the other hand, concerning the craftsmen of category 712, the finding of their absolute numbers per 4-digit category according to ISCO was achieved by contacting individuals of their respective federations. More specifically:

- The plumbers, fitters and boiler pipe installers (class 7126) currently stand at 15,000 persons, with an annual inflow of 1,000 people in the profession.
- The artisans, conditioning and refrigeration of class 7127 are amounted to 5,000 with an annual influx of 500 new professionals in the field.

[106] International Standard Classification of Occupations (ISCO-08), retrieved online from: http://www.ilo.org/public/english/bureau/stat/isco/isco08/index.htm

- The glaziers of category 7125, including doors and windows frames installers, rise to 18,000, and each year 1,500 young professionals enter the sector.
- As for classes 7121, 7122, 7123 and 7124, no separate detailed statistics were found of the exact number because they correspond to related professions and each person may perform more than one of them. However, in accordance with their respective federations' approximate data, they are estimated to 7,000.

Table 7.10: Absolute number of workers involved in energy saving and renewable energy installation buildings and annual inflow to the profession in classification ISCO-08

Professions' classification according to 3-digit ISCO-08	Professions' classification according to 4-digit ISCO-08	Absolute number of technicians	Annual inflow of new professionals
711 - Building frame and related trades workers	7111 - House builders	55,000	Negligible
	7112 - Bricklayers and related workers		
	7113 - Stonemasons, stone cutters, splitters and carvers		
	7114 - Concrete placers, concrete finishers and related workers		
	7115 - Carpenters and joiners		
	7119 - Building frame and related trades workers not elsewhere classified		
712 - Building finishers and related trades workers	7121 - Roofers	45,000	3,800
	7122 - Floor layers and tile setters		
	7123 - Plasterers		
	7124 - Insulation workers		
	7125 - Glaziers		
	7126 - Plumbers and pipe fitters		
	7127 - Air conditioning and refrigeration mechanics		
741 - Electrical equipment installers and repairers	7411 - Building and related electricians	9,000	700
Total		**109,000**	**4,500**

➢ In conclusion, employees in the construction sector related to the construction of energy-autonomous buildings and the installation of renewable energy systems in these now total at **109,000** and represent **53%** of all workers in the sector.

So, with a similar percentage assignment (53%) in the size of the construction sector forecast for 2020, derives the total number of workers and technicians on EE and RES in buildings at the end of the decade. The additional number required for meeting energy targets in Greece, compared with the existing one is also calculated. All these data are collected in Table 7.11.

Table 7.11: Aggregated employment related to the construction of new buildings by 2020

Reference Year 2020	Employed in the Construction Sector	Technicians/ Craftsmen on RES and EE	Additional required Technicians/ Craftsmen
Optimistic Scenario	320,000	170,000	61,000
Pessimistic Scenario	170,000	90,000	- ®
Neutral Scenario	250,000	133,000	24,000

® In the case of the pessimistic scenario, no additional technicians for new homes are needed, as there are already 109,000 (there is actually a surplus of 19,000 labourers for the construction of new buildings currently in relation to 2020).

Total labour force requirement until 2020

The labour force gap predicted for Greece until 2020, according to the methodology used, is calculated by summing up the craftsmen of stages A and B and analysing again in the 3 forecasting scenarios. Table 7.12 summarizes the results obtained.

Table 7.12: Estimated total labour force gap in Greece until 2020

Reference Year 2020	Labour Force Gap
Optimistic Scenario	90,000
Pessimistic Scenario	10,000
Neutral Scenario	53,000

7.3 Qualification needs (skills to be acquired)

7.3.1 Problems in the training of workers in the construction sector

Once the construction of a green building project is approved, people with the appropriate skills are needed to carry it out. Similarly, reconstruction of sustainable energy autonomous houses has introduced to the construction sector new technologies and manufacturing techniques. Although these new conditions change the required skills of workers and craftsmen, new building requirements can easily be met by the existing skilled workforce of the same specialty, with minimal additional training.

During the workshops and the interviews with partners and with employees under the BUS-GR, many problems were referred, related to the construction sector and in particular to the education of the workforce. Even simple construction tasks, such as installation of frames, are not assumed that they will be properly and effectively carried out.

Even today there are many professions which are exercised empirically, and their transfer from one generation to another, is carried out through traditional apprenticeship or empirical exercise. Such occupations are routinely construction occupations, particularly those relating to the rebuilding and reconstruction of buildings. Consequence of this practice is the inability of thousands of workers to demonstrate what they know or what they can do since there is no essentially reputable institution and valid way to certify their knowledge, skills and abilities.

Indeed, according to the chairmen of the respective federations' of workers in manufacturing sectors in Greece, most employees in the building sector are artisans without authorization.

Their practical skills are mostly learned through their labour experience and of course cannot be certified. The exceptions are some public construction and plumbing projects contractors.

The first working meeting of the National Qualifications Platform, carried out on 5 October 2012 by the consortium of project partners BUS-GR, highlighted several useful conclusions. The meeting was attended by representatives from 30 stakeholders, who exchanged views and expressed their opinion about the depiction of the current situation, the existing barriers, and the possible synergies with the umbrella of the BUS-GR initiative. Stakeholders at the meeting were given questionnaires of which 25 were returned fully completed.

In two indicative questions related to the skills of the building sector workforce, the responses of the bodies show the size of the problem. The **1st question** focused on the extent that the skills of the existing power of the techniques of building sector meet the needs of the market, while the **2nd question** was about the possibilities of specialized technical training on EE and RES systems for technicians currently employed in the building sector.

Participants evaluated the qualifications of existing installers using a 5-point scale, ranging from "unsatisfactory" to "fully satisfactory." The results of both questions are presented in the following two charts.

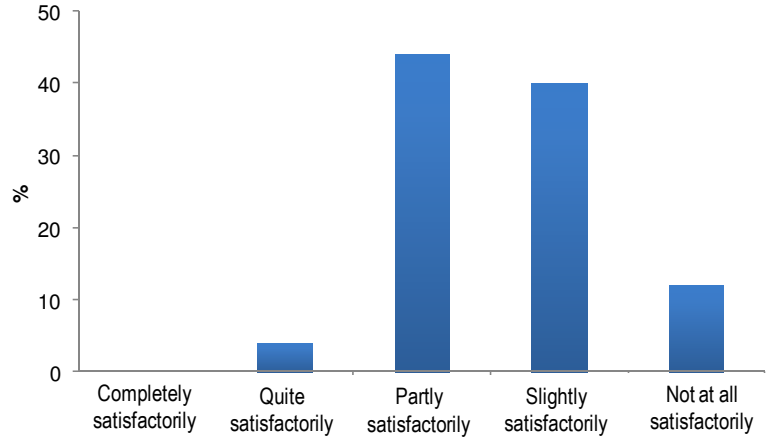


Figure 7.8: Results of responses to the question *"To what extent do you consider that the qualifications of the existing craftsmen in the building sector meet the needs of the market?"*

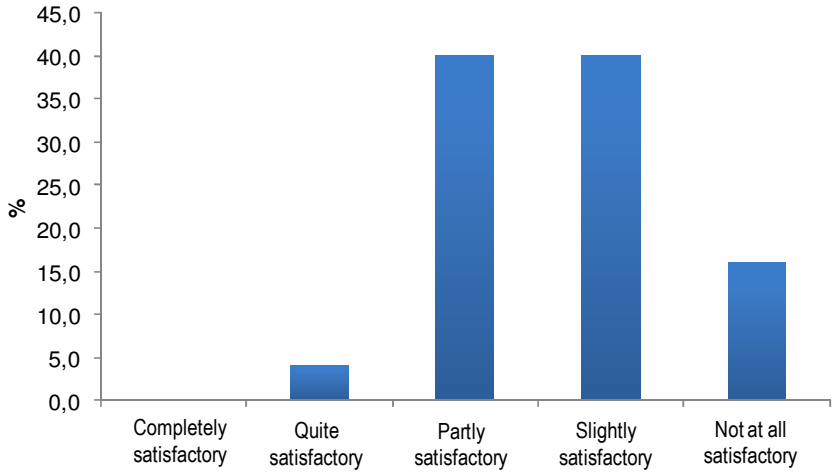


Figure 7.9: Results of responses to the question *"Do you think sufficient opportunities specialized technical training on EE and RES for technicians currently employed in the building sector?"*

7.3.2 Classification of new skills required to be obtained

In this paragraph a generalized classification of construction activities within NACE (Statistical Classification of Economic Activities in the European Community) is conducted. Then, these activities are separated to the individual tasks and skills they include, which relate to the construction of energy-autonomous buildings and energy upgrading of existing ones. The aim of this categorization is to record all the skills and construction works related to the achievement of energy targets in Greece for 2020.

Then, the existence of available training of artisans and labourers for the learning of each skill was studied. The training can be provided either by the National Vocational Training System (EPAL, IEK etc.) or various professional programs - seminars that may pertain to the theoretical and practical training of professionals (CVET). Finally, it was recorded if the skills related to each task of energy saving is certified by a certification process by the government agency EOPPEP.

All findings of the above methodology are presented in detail in the following overview table.

Table 7.12: Classification of new technologies and skills, inventory of existing training and certification

Type of construction activity	Activities' classification according to NACE	RES/EE related Activity/Skill	Available Training	Skill Certification
Buildings' construction	F41.2.0 - Construction of residential and non-residential buildings	Reconstruction of buildings' foundations	No	No
		Building shell reconstruction	No	No
Plastering and Insulation	F43.3.1 - Plastering F43.3.3 - Floor and wall covering	Specialization in high quality building shell insulation	Sporadic (by companies active in the field)	No
		Specialization in high quality floor insulation	No	No
		Specialization in high quality roof insulation	Sporadic (by companies active in the field)	No
Electrical installations	F43.2.1 - Electrical installations	Specialization in the installation of PV systems	Not in systematic basis	Yes (certif. of course attendance)
		Installation of lighting systems	Not in systematic basis	Yes (certif. of course attendance)
		Buildings' energy monitoring systems	Not in systematic basis	Yes (certif. of course attendance)
Mechanical installations	F43.2.2 - Plumbing, and heating and air conditioning installations	Effective replacement of heating systems	Not in a systematic basis	Yes (certif. of course attendance)
		Effective replacement of air conditioning systems	Not in a systematic basis	Yes (certif. of course attendance)
		Specialization in ventilation systems	Yes	Yes
		Specialization in heat pumps (air source, geothermal)	Not in systematic basis	Yes (certif. of course attendance)

Glazing installation	F43.3.4 - Painting and glazing	Specialization in high insulating glazing	Not in systematic basis	Yes (certif. of attendance)
		Specialization in sun proof windows	Not in systematic basis	Yes (certif. of attendance)
Roof construction	F43.9.1 - Roofing activities	Installation of solar thermal systems	Sporadic (by companies active in the field)	Yes (certif. of attendance)
		Specialization in green roofs	No	No
Joinery works	F43.3.2 - Joinery installation	Installation of doors and windows	Sporadic (by companies active in the field)	No
		Reconstruction of wooden floors	No	No
		Reconstruction of wooden roofs	No	No
		Installation of glazing in frames	Sporadic (by companies active in the field)	No
Manufacture and installation of metal frames	C25.1.2 - Manufacture of metal doors and windows	Manufacture of high insulating metal frames	Yes (by INKAL)	Cert. of course attendance
		Installation of high insulating metal frames	Yes (by INKAL)	Cert. of course attendance
		Installation of glazing in frames	Yes (by INKAL)	Cert. of course attendance

7.3.3 Need for training of workers

From the findings of the above paragraph, it is evident that in Greece there is a great need to educate the workforce in the construction sector. Admittedly, as was already mentioned, the ability of workers to cope effectively with the tasks in the ES and install renewable energy systems should be reviewed through monitoring mechanisms, continuing education and certification of individual qualifications.

However, the distinction of the workforce between people who need further training and people who are already trained, according to the educational needs proposed by the EU, is a hard work. This distinction is more related to the impact of the activity performed by each different professional group, i.e. the extent to which each will contribute to the energy goals of 2020 (see Section 7.2). An element that makes this task more difficult is the lack of accreditation that exists in Greece with regard to energy-saving activities in buildings and the installation of renewable energy systems, as depicted in Table 7.12.

- Conclusion: This lack of certification, the general view that there is a significant gap of skills of employees in RES and energy saving activities in buildings, as well as the strict objectives for energy saving in Greece by 2020, imply the need for additional training for the 100% of the aforementioned employees.

Although it is considered that the higher educated professionals (engineers, managers, etc.) are the ones who should have substantial knowledge and training on energy savings, as they are responsible for planning and managing, also the technical manpower should have at least general knowledge on these issues to ensure proper completion of their tasks. Regarding the priority might be given, characteristic is the response of the bodies in the question for the professions that they consider that need immediate priority training on RES and EE in the construction sector. As the responses to this question were given in free text format, the results have been illustrated using the following tag cloud.

Figure 7.10: Results of responses in the form tag cloud to the question *"Based on the experience of your organization, note the professions that you think deserve priority in training on RES and EE in the construction sector"*

In conclusion, these middle training categories of workers are those that require a greater degree of training in energy efficiency, as they are often needed to use new materials and techniques to understand instructions from project officers and to coordinate and orient their unskilled workers. Given that the production processes in construction cover a wide range of stages involving large numbers of people with different profiles and different expertise, experts believe that some basic issues on energy saving and renewable energy systems should be taught to all employees without exception. Thus, it is considered that the risk of failure of saving energy interventions in buildings will be minimized.

7.3.4 Education centres

The existing training centres in which the basic and continuing education for professionals (IVET & CVET) of all disciplines is carried out are highly heterogeneous. Their network consists of the specific vocational training courses and professional training seminars. But, as already mentioned, in vocational education on energy saving and RES systems, Greece has stayed well back. The BUS-GR and the composition of the national qualifications Roadmap (Roadmap) consist a great opportunity for the maturation of the country in these areas, with great benefits as already described.

Education centres to be established should be distributed uniformly throughout Greece, to facilitate workers to transport and maintain their homogeneity. Also, special attention should be paid to maintain their permanent and recurring character at regular intervals (depending on the type of skill related).

7.3.5 Trainers and costs of trainings

Currently there is no mechanism for evaluating and selecting suitable trainers for vocational training programs on energy saving and renewable energy systems installation. However, it is believed by experts in the area that trainers should be people in the sector, specialists in building sustainable buildings that in parallel have the practical experience. In line with other economic sectors in Greece and the creation of vocational training of employees, it is empirically calculated that for every 15 apprentices' professionals per year one trainer is assigned. Thus, taking into account the uniform training of workers in the construction sector within 7 years remaining until 2020, approximately 1,900 trainers are required.

For the estimated 119,000 to 199,000 target group (potential trainees), in the 7 years period between 2013 and 2020, a total number of approximately 700 to 1100 courses per year are requested (for groups of ~25 trainees per course). This means an approximate cost of the entire training procedure – for courses with a 3-days duration (3,000 €/course) - between

2,100,000 and 3,300,000 euros per year (or something between 15 and 21 million € for the next 7 years period).

7.3.6 Certification of qualifications

The final and decisive stage of the European Initiative "BUILD UP Skills", is the certification of the acquired skills. The certification of qualifications is a key to the employee for his professional achievement and progress. In addition, it is an incentive of competitiveness for his colleagues to act respectively. Specifically:

- Certification and recognition of qualifications of workers, particularly those arising from non-formal or informal learning, in line with the EQF, could contribute to tackling unemployment and the (upward) occupational mobility of workers so as to improve the remuneration and career advancement opportunities for workers.
- The qualifications certification should not be limited to one type of academic recognition, without the utilitarian and practical value that it can provide to the labour market. In other words the utilitarian and pragmatic nature of national qualifications frameworks (initially) should be highlighted, and then the common European to address effectively the problem of unemployment, poverty, destitution, and the consequent social exclusion.
- In this way, thousands of people who either through their work or through their experience possess qualifications which they could not prove, are given the opportunity through national qualifications frameworks to certify them, placing them on the national scale in each member country of the EU must establish by its own educational, professional, etc. criteria.

However, Greece regarding accreditation issues is left behind, reducing in this way the strength of its workforce in Europe. The importance of certification of qualifications within the BUS-GR, is also shown within a question related to the evaluation of the initiative to create a platform for qualifications of workers in the construction sector in matters of EE and RES in Greece. The vast majority of professional bodies, 72% of them, described the initiative as necessary, recognizing the certification and training gap that is currently in place for the technicians / installers of RES and energy saving measures in the building sector. The rest 28% described the initiative as very useful (none considers this as less useful or indifferent – as is presented in the diagram of figure 7.11).

This finding is extremely important because it demonstrates that the technicians / installers themselves recognize the problem of absence of certification of skills underlying their sector, along with all its consequences.

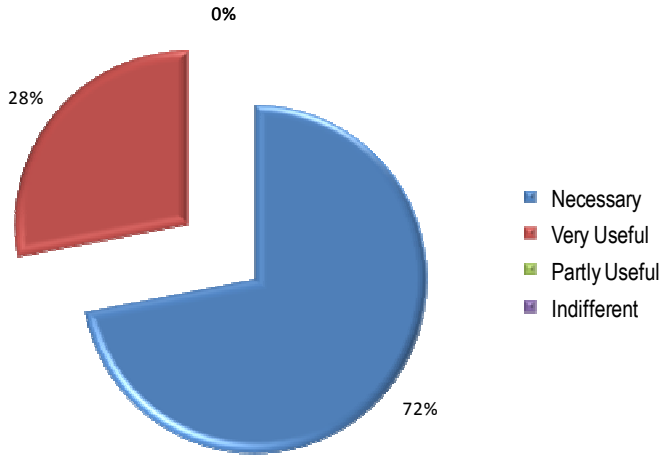


Figure 7.11: Results of responses to the question «*Evaluate the initiative to create a platform for the qualification of workers in the construction sector in matters of EE and RES in our country*»

8. Barriers

During the analysis of the questionnaires that were distributed to the members of the National Qualifications Platform (NQP), at its first Workshop (kick-off meeting, 5th October 2012), as described in Chapter 7, several obstacles were found regarding the meeting of energy targets set for 2020.

According to a relevant inquiry addressed to the stakeholders that were present in the NQP's kick-off meeting (representing their federations / associations / bodies) as regards the "*Main obstacles for the improvement of the vocational qualifications of the technicians in the building sector*", the answers collected are graphically presented in Figure 8.1.

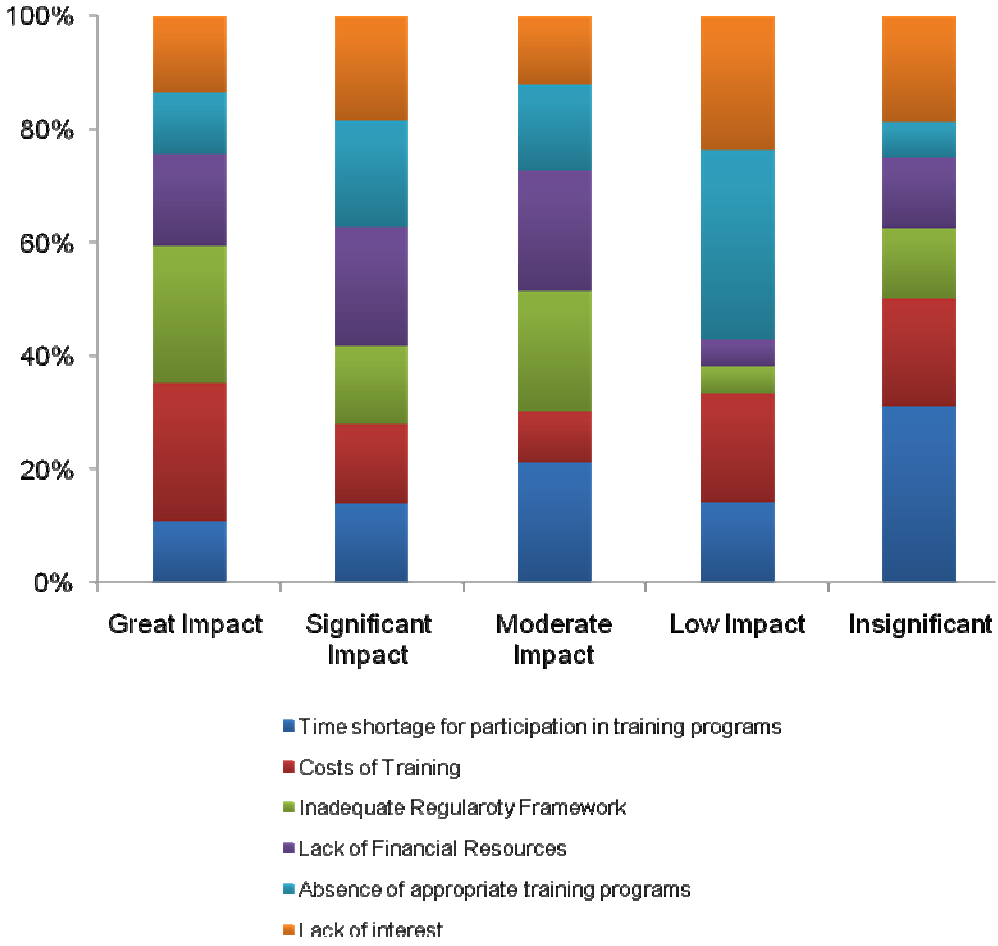


Figure 8.1: Results of the responses to the question "*According to your opinion what are the main obstacles to the improvement of the vocational qualifications of the technicians in the building sector? Rate with grades from 1 to 5 (Insignificant - Great Impact)*"

As it is obvious from the figure above, the **training cost** and **the inadequate institutional framework** are considered to be the two obstacles with the greatest impact, while the lack of **financial incentives** follows. The rest of the obstacles are following an isobaric/balanced distribution and these include the lack of the suitable training programs, the lack of availability to participate in such programs, as well as the reduced interest of the technicians themselves for any training.

Also, in the frame of this specific question, and through the addition of optional text as part of this question, the participants identified other obstacles that they are actually facing as

regards the improvement of their vocational qualifications. The major barriers, identified by the participants, include:

- ✓ the current recession in the construction activity,
- ✓ the lack of confidence towards the state as regards the identification of the training needs and the certification of the technicians,
- ✓ the lack of added value for the technicians themselves and their professional development, resulting from the consumers' inadequate information, so that they are bale to address themselves to certified technicians.

Consequently, the most important barriers can be categorized as follows:

- Barriers due to an inadequate institutional framework;
- Barriers identified at the educational and vocational training system;
- Market barriers;
- Barriers in the construction sector.

Each of the above four "barriers category" is further discussed and analysed in the following sections.

8.1 Barriers due to inadequate institutional framework

Although the European Parliament Directive 2009/28/EC, of April 23, 2009, on the promotion of the use of renewable energy sources, and the repealing of Directives 2001/77/EC and 2003/30/EC, and especially according to Article 14: "Information and training", the Member States should be prepared for the training and certification of the small-scale Renewable Energy Systems installers by the end of 2012, there is no compliance with this Directive in Greece yet. On the contrary, there is a lack in the certification and the training of the workforce of technicians / installers, working in RES and RUE activities of the building sector, as already explained in Chapter 7.

8.2 Barriers identified at the educational and vocational training system

1. Lack of funding, inadequate facilities and equipment

Extensive investment in equipment and training facilities is required for the vocational training of the manpower employed in construction projects, in order for them to acquire the appropriate knowledge to be able to integrate RES into buildings. To achieve this, first an adequate funding must be ensured, and as a second step all the involved educational stakeholders must cooperate with the various companies, in order for the best possible result to be achieved.

- ✓ Another relevant question raised was whether the involvement/participation of the organisation/institution that each participant was representing in the NQP's workshops /conferences of BUS-GR is one of the priorities of the specific organisation / institution, the answers received were very characteristic:

23 out of the 25 respondents, answered positively ("yes"), one responded "somewhat," and just one of them responded "I do not know / I do not answer." Therefore, the vast majority (96%) responded positively, while there were no negative responses.

- ✓ These results suggest that even the guilds / federations of craftsmen / workers have set the issues of training and certification as priorities in their organizations, and that their priorities reflect the priorities of the platform, as well.

2. Lack of educational programs for the vocational training of trainers

It is generally accepted that there are currently neither facilities nor programs for the training of trainers. Also, there is no authority/body responsible for the monitoring and the anticipation of the training needs. The intensive cooperation between all stakeholders, such as educational institutions, professional associations, chambers and especially the cooperation with the relevant State's representatives is vital. Only by identifying the training needs and with the technicians' certification, the lack of confidence in State will be addressed.

3. Insufficient number of trained trainers

The number of trainers is currently clearly inadequate. Immediate steps should be taken for the increase of the number of qualified trainers, taking into account that the remuneration packages should be attractive. During the Workshop, the representatives of the involved stakeholders expressed suggestions as regards the establishment of a formal training and certification procedure.

These proposals include:

- Working groups and meetings of the National Qualification Platform in a regular basis, focusing in craftsmen / installers, by category.
- The promotion of the transparency and the updating, through the notification of the minutes of meetings, targeted publicity actions and use of understandable terminology, appealing to the average installer.
- The exploitation and the harmonization with the existing occupational profiles, registers and codes of professional ethics.
- Synergy with the activities of the existing stakeholders (OAED, TCG).
- Differentiation in the handling of licensed and unlicensed professions.
- Specialized though economical training programs.

8.3 Market barriers

1. The lack of investors' interest in Renewable Energy Projects

In the summer of 2010, our country presented the National Action Plan for Renewable Energy Sources (timeframe 2010 – 2020). It is an ambitious project that aims to reshape the country's energy mix, in order to meet the 2020 binding targets of energy savings, as it has already been presented in detail, in previous chapters.

However, the expected interest in new renewable energy projects has not been recorded, due to the high construction cost of RES infrastructure, the inadequate information towards the citizens as regards the financial and environmental benefits and the lack of additional incentives for the investors. This fact leads automatically to a reduced interest for special training, both on behalf of the state and of the practitioners themselves.

Also, the recent incorporation in the Greek Legislation (September 2012) of the European Directive 2010/31/EU (May 19, 2010), regarding the "Building Energy Performance", with Article 9: "Buildings with nearly zero energy consumption - **net Zero Energy Buildings**

(NZEB)", defines that since the beginning of 2021 all new buildings must be **nearly Zero Energy Consumption Buildings** and in reference to the new ones that house public services, the obligation will be effective from 01.01.2019. Therefore, at the present moment, there is no incentive for NZEB and national programs to support new NZEB. It is obvious that the current projects, primarily related to new buildings and building renovations, do not meet the high standards of energy savings.

8.4 Barriers in the construction sector

1. Low educational level of the workforce

The low educational level of the workforce is a threat to their active participation in trainings and to the implementation of new technologies. Also, a large proportion of the workers engaged in the construction work, is not of Greek citizenship. According to the Social Insurance Institute (IKA) Directorate of Actuarial Studies and Statistics, in February 2012 the 10.12% of the insured workers in the field of construction and technical projects were foreigners.

On the other hand, among the uninsured workers, one out of two workers of construction and technical projects, is a foreigner, according to a research conducted by mixed control crews from EYPEA (Insurance Control Special Service) of the Social Insurance Institute (IKA) of Greece and SEPE (the Labour Inspectorate) for the first half of 2012. The biggest majority of the foreigners are facing difficulties with any training provided in the Greek language. This fact creates a problem as regards their training and forces to learning methods, applicable only through practice.

2. The impact of economic crisis

The sharp decline in the construction activity in Greece, especially during the last three years, has changed dramatically the priorities of the construction companies, which had to reduce a large part of their expenses. Thus, the vocational training of their workers has become a secondary priority.

3. Incentives for the workforce

There are actually no incentives for the participation of the existing workforce in training activities. The most important reason for this is the large percentage of uninsured workers in the Greek construction sector.

4. Labour market segmentation

The majority of construction projects are clustered in the biggest cities of the Greek country. There is therefore a regional disparity and moreover the seasonal workers are usually not interested in participating in educational programs.

5. Low professional status

The unfavourable public perception of the profession of the builder (more general, of the "blue collar" worker) consists of a significant barrier for the attraction of young and ambitious people in the field (most of the youngsters prefer to become "black collar" workers, instead). The relatively high wages that were paid to construction workers during the growth of the construction sector has surpassed this obstacle to some extent, but it still exists today due to the economic crisis.

6. Age structure of the workforce

One problem, emanating from the age diversity, is that older workers do not usually express any interest in the continuing vocational training and new technologies. This has resulted in a decline of the interest in the continuing training of the workforce and therefore the progress of the young people in this specific occupational area is hindered.

9. Conclusions

Buildings and transportation are the most energy-consuming sectors in Greece. Buildings in Greece account for approximately 36% of the total energy consumption, while, during the years 2000-2005, relevant energy consumption increased by approximately 24%, one of the highest increases in Europe. One of the main reasons why Greek buildings consume so much energy (taking into account the climate conditions of Greece, Greek buildings are – probably – the most energy intensive in Europe) is that they are old and have no built-in state-of-the art technology, due to the lack of relevant legislation over the last 30 years.

According to the estimations made when planning the national comprehensive programme "Building the Future" for the improvement of the energy efficiency of the building stock of Greece, if the existing buildings will not be renovated from the energy and environmental point of view, then by 2020 there will be an increase in energy consumption by 19% compared to 2010. This means that the Greek consumers will have to pay 21 billion euros for individual building interventions and 70 billion euros to cover their energy needs. On the other hand, with just 24 billion euros for energy saving interventions in the building stock (in 600,000 detached houses, 500,000 apartments and 300,000 commercial buildings), the targets for 2020 can be achieved.

At the same time, the binding target for 20% share of renewable energy in the gross final energy consumption in 2020, as well as that for nearly Zero Energy Consumption Buildings (NZEBs) from the beginning of 2021 (for the new public buildings, this obligation becomes effective even earlier), pose great challenges for the renewable energy systems and energy efficiency technologies/techniques businesses in Greece. It is important to mention that, the Hellenic Ministry of the Environment, Energy and Climate Change (MEECC / YPEKA), during the development of the corresponding legal framework for the achievement of '20-20-20' targets, has combined the implementation of energy efficiency interventions in buildings with the maximum possible use of RES systems on them in order to cover part (or all) of their energy needs.

On the other hand, one of the main pillars of the Greek economy, the construction sector, is suffering from the economic recession. Construction sector has seen a continuous decline the last years and is one of the most affected business sectors from the economic crisis. Greece's market has been oversupplied, large buildings and residential areas are now empty and there is no sign of stopping this trend. The energy renovation of the existing building stock and the prospects for new nearly Zero Energy Consumption Buildings (NZEBs) seem to be the "solution" to this big problem.

Within this context, the Greek State has to develop a set of financial incentives, with co-financing from the European Union, for the implementation of energy efficiency upgrading interventions in all kind of buildings, but also to stop the continuous shrinking from one year to the next of the Public Investment Programme. In order for the efforts for a fiscal adjustment of Greece to be successful there must be prospects for economic development, which is the basic prerequisite for the debt reduction over the long term. A major role in these perspectives for development will need to be played by public infrastructure investments either with public funds or through the National Strategic Reference Framework and other structural funds. They will have to be invested in small and medium-sized infrastructure projects with immediate absorption and multiplier effect.

Of course, another major issue that rises is whether the construction sector (and the industry as a whole) in Greece is ready to deliver high energy performing renovations, as well as new (nearly zero energy) buildings. This was the objective of the present report of the "BUILD UP

Skills – Greece" project, which tried to provide an analysis of the status quo of the building stock and its energy performance, and to make the necessary comparisons with the national targets for 2020, in order to identify the barriers and gaps that the buildings construction sector is facing, with special focus on employees' skills, for the achievement of the relevant energy targets.

Within this context, the existing relevant strategic planning documents and action plans have been examined, the targets and the corresponding legislative provisions undertaken by the State have been presented and an analysis of the data and information regarding the building stock, energy, the human resources and the vocational education and training system has been carried out. The skills needs related to a qualified workforce of "blue-collar" workers (craftsmen, technicians, installers) in the construction sector have been also identified, as well as the barriers and gaps for the achievement of the national targets for 2020. All these are presented in the necessary (and according to the guidelines provided) detail in the previous chapters of the report.

Despite the slowdown observed in its activity due to the economic crisis, the construction sector remains and should remain an important sector with regard to employment, as a considerable number of employees are working in it. More specifically, a large number of workers from the EU or the third countries are employed in the sector, mainly in technical occupations. As a serious and direct consequence of the recession observed through the construction sector, the number of unemployed people has significantly risen during the last years as well.

Some of the main factors which are expected to influence the construction sector in the years to come are the development of the Greek as well as the global economy, the cost of borrowing and the ability of the banks to proceed with the financing of investors/individuals, foreign demand, the preparation of a programme of incentives for development, the rationalisation of taxation, the simplification of the urban planning and building permits procedures as well as the cost of land in Greece.

What is mostly expected in view of the market trends is a turn to a higher quality in design and construction as well as the selection of construction areas that will have comparative advantages. Furthermore, even more of the existing buildings are expected to be renovated and upgraded since, as mentioned previously, there is a considerably large part of the building stock that was built before 1970. On the other hand, the fact that the national action plans were developed before the launch of the economic crisis fosters some degree of uncertainty, as regards the achievement of the '20-20-20' targets, which is reinforced by the consequences of the continuing economic crisis.

The flexibility and the adaptability of the Vocational Education and Training System is critical in order to address the challenges that may arise. Currently there is a significant lack of appropriate CVET courses for RES and EE addressed to the building sector. The limited number of occupational profiles related to EE and RES in the building sector (only 4% of the certified profiles) and/or the outdated or missing information regarding the "green skills" areas is currently a drawback for the development of skilled building workforce. New skills are required including skills on new technologies/equipment, as well as up-to-date qualification frameworks.

Thus, the continuous review and upgrade of the existing programs, or even the addition of new ones, according to the currently emerging technologies, and most importantly the training of trainers so that they are able to enrich their existing knowledge and skills, combined with the creation of incentives for the young people to follow technical occupations are of critical importance. It is expected that the total employment needs, with regard to the technical occupations related to the "BUILD UP Skills - Greece" project, will be significantly

increased during the next years till 2020. Moreover, the analysis of the status quo has contributed to the identification of important skills needs related to the most critical technologies for the achievement of the 2020 targets.

The targets set for energy and buildings are supposed to be reachable, but on the grounds that there will the necessary legislative and regulatory provisions will be promoted. Provisions for the necessary structures for monitoring and certification are also required. An important finding is that there is promising evidence for the fulfilment of the quantitative and qualitative needs for human resources, taking into account the structure, capabilities, and flexibility of the Vocational Education and Training System in Greece.

It should be mentioned that for the '20-20-20' targets' achievement, the needs of the construction sector's enterprises should be constantly monitored and, in any case, the necessary measures must be taken so that these needs are met. Finally, the basis for the next stage of this project being the preparation of a Roadmap with a time horizon for completion by 2020 is set. The Roadmap is foreseen to include the main policies and actions that are required for the identification and establishment of the successful vocational education and training framework for the Construction sector and other relevant sectors, so that they acquire a qualified workforce in energy efficiency and renewable energy to actively contribute to the achievement of national targets for 2020.

10. Authors/contributors

The following list of people (teams from the BUS-GR consortium partners) worked for the accomplishment of the present report:

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11. Glossary

Abbreviations

Adult Training Centres	KEE
Association of Greek Contracting Companies	SATE
Centre for Renewable Energy Sources and Saving	CRES
Centre of Distance Lifelong Education	KEDVMAP
Continuing Vocational Education & Training	CVET
Continuous Vocational Training	CVT
Energy Efficiency	EE
Energy Performance of Buildings Directive	EPBD
Energy Performance of Buildings Regulation	KENAK
European Qualifications Framework	EQF
Energy Services Directive	ESD
General Secretariat for Adult Education	GSAE
General Secretariat of Lifelong Learning	GSLLL
Greek General Confederation of Labour	GSEE
Greek Manpower Employment Organisation	OAED
Hellenic Accreditation System	ESYD
Hellenic Confederation of Professionals, Craftsmen and Merchants	GSEVEE
Hellenic Qualifications Framework	HQF
Hellenic Statistical Authority	ELSTAT
Initial Vocational Education & Training	IVET
Institute of Adult Lifelong Education	IDEKE
International Standard Classification of Education	ISCED
International Standard Classification of Occupations	ISCO
Lifelong Learning	LLL
Lifelong Learning Centre	KDVM Level II
Ministry of Education and Religious Affairs, Culture and Sports (formerly the Ministry for Education, Lifelong Learning and Religious)	MERACS (former MELLR)
Ministry of Environment, Energy and Climate Change	MEECC (YPEKA)
Ministry of Labour, Social Security and Welfare	MLSSW
National Organisation for the Certification of Qualifications and Vocational Guidance	EOPPEP
National Accreditation Centre for LLL providers	EKEPIS
National Energy Efficiency Action Plan	NEEAP
National Institute of Labour and Human Resources	EIEAD
National Organisation for Vocational Guidance	EKEP

National Qualifications Framework	NQF
National Reform Programme	NRP
National Renewable Energy Action Plan	NREAP
National Strategic Reference Framework	NSRF
National System for linking Vocational Education and Training to Employment	ESSEEKA
Organization for Vocational Education and Training	OEEK
Renewable Energy Sources	RES
Second Chance Schools	SDE
Second Level Vocational High School	EPAL
Vocational Education Training School	EPAS
Vocational Training Institute	IEK
Vocational Training Centre	KEK
Youth and Lifelong Learning Foundation	INEDIVIM

Annex I: The 8 reference levels of the EQF defined by learning outcomes and coinciding with the Hellenic Qualifications Framework

Level	Knowledge	Skills	Personal and Professional skills			
			***(i)* Autonomy and responsibility**	***(ii)* Learning ability**	***(iii)* Communication & social skills**	***(iv)* Professional & specialized competence**
1	Recall of basic general knowledge	Use of basic skills to perform simple tasks	Completion of the work or studies under direct supervision and demonstration of personal efficacy in simple and stable environments	Accept counseling in learning	Response to simple written and verbal communication Demonstration of social role	Knowledge of procedures for solving problems
2	Recall and understanding of basic knowledge in one subject area, the range of relevant knowledge is limited to the facts and main ideas	Use of skills and key competencies - (http://europa.eu.int.comm/education/policies/2010/doc/basic2004.pdf) for the performance of tasks where action is governed by rules that define routine activities and strategies Selecting and applying of basic methods, tools and material.	Taking limited responsibility for the improvement of the efficiency at work or studies, in simple and stable environments and within familiar, homogeneous groups	Search for counseling in learning	Response to simple but detailed written and oral communication Adaptation of roles in different social contexts	Solving of problems using the information provided
3	Application of knowledge in a subject area that includes procedures, techniques, materials, tools, equipment, terminology and some theoretical ideas	Use of a series of specific skills of the field for the performance of duties and presentation of the personal explanation through the selection and adaptation of methods, tools and materials Evaluation of different approaches to tasks	Responsibility for the completion of tasks and demonstration of some independence as regards the role in work or studies, where the environments are generally stable, but some factors do change	Taking responsibility for personal learning	Production of detailed written and oral communication (and reaction to it) Taking responsibility for self-understanding and behavior	Solving of problems using well-known sources of information, taking into account certain social issues
4	Use of a wide range of practical and theoretical expertise in the subject area	Development of strategic approaches to tasks that arise at work or studies, applying expertise and using experts'	Management of a role under consulting at work or studies environments that are usually	Demonstrate self teaching	Production of detailed written and oral communication (and reaction to) in unfamiliar	Solving of problems by integrating information from experts' sources taking into account relevant social and

		sources of information Evaluation of outcomes in relation to the strategic approach used	predictable and wherever there are many factors that cause changes and wherever some factors are interrelated Proposals for the improvement of the results Supervision of routine work of others and taking some responsibility for training others		situations Use of the self-understanding for change in behavior	ethical issues
5	Use of broad theoretical and practical knowledge often specialized in one area and also being aware of the limits of knowledge base	Development of strategies and creative responses in seeking solutions to specific and defined abstract problems Transfer of theoretical and practical knowledge in creating solutions to problems	Independent management of projects that require problem solving, where there are many factors, some of which interact and lead to unpredictable changes Demonstration of creativity in projects development Managing of people and review of their personal performance and the performance of others Training of others and development of team performance	Assessment of personal learning and determination of learning needs that are necessary to undertake continuous learning	Transfer of ideas in a well-structured and coherent manner to peers, supervisors and clients, using qualitative and quantitative information Expression of comprehensive internalized personal view for the world that reflects the contacts with other people	Phrasing of responses to abstract and specific problems Demonstration of experience in functional interaction within a field Reaching conclusions based on knowledge on relevant social and ethical issues
6	Use of detailed theoretical and practical knowledge of an area. Some knowledge hold the most important place in the field and they concern critical	Demonstration of proficiency of the methods and tools in a complex and specialized field and demonstration of innovation in relation to the methods used	Taking responsibilities on the administrative planning, resources and team management in work and studies environments that are unpredictable and require	Constant assessment of personal learning and identifying learning needs	Communication of ideas, problems and solutions to both specialized and unskilled audiences, using a series of techniques involving qualitative and quantitative information	Collection and interpretation of relevant data in a field in order to solve problems Demonstration of experience in the functional interaction in a complex environment

	understanding of theories and principles	Inventing and accepting arguments for problem solving	the solving of complex problems where too many factors interact Demonstration of creativity in projects development and initiatives undertaken in administrative mechanisms, including training of others to develop team performance		Expression of a comprehensive internalized personal world view, showing solidarity to others	Reaching conclusions based on social and ethical issues that arise in work or studies
7	Use of specialized theoretical and practical knowledge, some of which possess the most important place in the field. This knowledge is the basis for originality in developing and/or applying ideas. Demonstration of critical awareness of knowledge issues in the field and "interfaces" between different fields.	Creation of research based on the diagnosis of problems by incorporating knowledge from new or interdisciplinary areas and drawing conclusions with incomplete or limited information. Development of new skills, in response to knowledge and techniques under development.	Demonstration of leadership and innovation in work and studies environments that are not familiar but complex, unpredictable and require problem solving on many factors interacting with each other. Reviewing of the strategic performance of teams.	Demonstrate autonomy in the direction of learning and a high level of understanding of learning processes.	Communication of project results, methodologies and boost rationale in specialized and unskilled audiences, using appropriate techniques Thorough examination and consideration of social norms and relationships and taking actions in order to change them	Solving of problems by incorporating complex sources of knowledge that are sometimes incomplete in new and unfamiliar environments. Demonstration of experience in the functional interaction, in terms of changes of management in a complex environment. Reaction to social, scientific and ethical issues encountered in work or studies.
8	Use specialized knowledge for the critical analysis, evaluation and synthesis of new and complex ideas that are in the most advanced stage of a field Extend or redefine existing knowledge and	Research, development, planning, implementation and adaptation of projects leading to new insights and new procedural solutions.	Demonstration of strong leadership skills, innovation and autonomy in work and studies environments that are new and require solving problems involving multiple factors that interact with each other.	Demonstrate capacity for stable commitment to the development of new ideas or processes and a high level of understanding learning processes	Authorised contact through the participation in critical dialogue with peers in a skilled community. Thorough examination and consideration of social norms and relationships and consulting action for their change.	Critical analysis, evaluation and synthesis of new and complex ideas and strategic decisions based on these procedures Demonstration of experience in functional interaction with the potential of a strategic decision making within a complex environment

	/ or work experience in a field or in the "interface" between disciplines.					Promoting of social and moral progress through actions

Annex II: IVET Training courses relevant to EE/RES in the building sector

	Specialisations	EPAS	EPAL	IEK (lower secondary school graduates)	IEK (upper secondary school graduates)	Lessons or part of lessons relevant to EE or RES on buildings	Further info
Building Works	Plasterer			√		In the frame of the lesson: **Health and safety at work**. Environmental Protection Fundamentals. Use of environmentally friendly materials.	
	Painter			√			
	Builder			√			
	Building Works Technician				√	None relevant	http://epas-xanth.xan.sch.gr/ktir.htm
	Maintenance & repair of historical & traditional buildings				√		http://ktiriakaepasthivas.blogspot.gr/p/blog-page_09.html
	Construction Designer		√				http://users.sch.gr/grasy-epal-elven/domikwn.html
	Internal Space Planning	√					
Aluminum and Iron Constructions	Aluminum & iron constructions technician	√		√		In the frame of the lesson: **Recycling of Raw Materials and Environmental Protection**: Current trends in technology new materials and energy saving as well as constructions for PV modules.	
	Metal structures Technician						
Carpentry Works	Carpenter	√		√		In the frame of the lesson: **Work Safety - Environmental Protection**: Energy Saving	
	Carpenters / Joiners						
A/C Installations	Thermal Installations Technicians	√		√		In the frame of the lesson: **Work Safety - Environmental Protection**: Energy Saving	
	Refrigeration & air conditioning technician				√	None relevant to EE/RES on buildings	
	Thermal & plumber Installations technician				√	In the frame of the lesson: **Heating of drinking water** - Heating of drinking water using RES, Solar Installations, Heat pumps, Measures for energy saving	EOPPEP: Training regulation for the specialty "Cooling, ventilation and air-conditioning technician". PDF file

	Thermal & Plumber Installations technician	√				None relevant to EE/RES on buildings	http://epas-xanth.xan.sch.gr/therm.htm
	Hydrothermal Installations and Central Heating Maintenance	√				None relevant to EE/RES on buildings	http://www.epas-chanion.gr/index.php/1
	Mechanical installation & construction	√	√				
	Cooling equipment and air conditioning		√				
Electrical Installations	Internal electrical installations technician				√	In the frame of the lesson: **Environmental Protection:** • Introduction to energy saving • Conventional energy sources • CO2, CO, NO, etc. emissions • RES. Wind, solar, biomass, geothermal • Passive energy saving techniques in buildings. • Energy accounting • Environmental protection • Recycling	
	Automation Technicians				√	In the frame of the lesson: **Automation Systems**	
	Electrical facilities		√				
	Electrical Works Technician	√				None relevant	http://epas-xanth.xan.sch.gr/hlek.htm

Annex III: CVET Training courses offered by KDVM Level II Centres operated by social partners

Training Provider	Title of the training course/seminar	Target Group	Duration (hrs)	Number of trainees per cycle	Content/ Basic modules	Certificate of attendance or other title	Training Courses per year
KDVM LEVEL II CENTRE IVEPE	Burners and Boilers' Maintenance & Repair	Thermal and Plumber Installations technician	20	N/A	Maintenance of heating installations, Different Techniques. Tests & adjustments required in boilers and burners. Familiarize with tools and special parts of the boiler room / Burners, Boilers/ Hot water distribution systems		2010 (1) 2012 (1)
	Maintenance of Electrical Equipment	Craftsmen, foremen and other supervisors of maintenance	16	N/A	Maintenance Standards, basic knowledge about the control methods and treatments on electromechanical components, necessary knowledge about the importance of lubrication and lubrication methods and practices.		2012 (1)
	Geothermal Installations	Engineers and technicians who work on RES and air conditioning of buildings	12	N/A	new forms of air conditioning (cooling - heating) like the shallow geothermal energy/ Legislative framework, Types of Geothermal Systems & Selection, Geothermal Heat Pumps, Design and Dimensioning, Description of the geothermal air conditioning, Examples		2012 (1)
KDVM LEVEL II CENTRE IVEPE	PV installations	Engineers and PV technicians	18	N/A	Concepts, definitions, basic principles of PV conversion, Autonomous, hybrid and grid connected PV systems, construction details. Solving problems that occur during operation, economic evaluation of investment. Legislation for BIPVs and BAPVs.		2012 (1)
	Operation and maintenance of gas networks	Craftsmen involved in Mechanical maintenance, at least primary school graduates with industrial experience 5-10 years, or technical schools graduates (experience 1-10 years	N/A	N/A	Internal natural gas installations, safety, operation and maintenance of these facilities.		2010 (1)

KDVM LEVEL II CENTRE of Heraklion Chamber	Design of PV systems	Potential investors / PV installers	8	N/A	PV technologies and comparative performance, Inverter Technology – Classification, interconnected systems, meteorological data from various regions in Greece, Legislation related to non-interconnected systems, Investment costs – Cost efficiency system, Examples of equipment selection		2011 (1)
Centre for Professional Development KEA	Geothermal heat pumps and water management		90	N/A	Training in new techniques of plumbing, geothermal systems		2011 (1)
IEKEM TEE	Energy Efficiency and Certification of Buildings (Directive 2002/91/EU)	Engineers, technicians and electricians	20	N/A	2002/91EU Directive, basic energy concepts and elements of building, bioclimatic design and passive heating and cooling, waterproofing techniques, thermal insulation of buildings.		2011 (1)
	Practical Guide for Energy Conservation in Buildings, Hotels, Industries and Sports Centers	Engineers and technicians	20	N/A	energy-saving interventions in buildings, hotels, sports centers and industries in the following areas: Glazing, Lighting, Hot water use, Heating, cooling, Natural Gas, Energy Management System (BEMS), Electrical systems, domestic appliances, Green building		2011 (1)
	Financial Evaluation of Energy Saving Interventions	Engineers and technicians	20	N/A	economic evaluation of any intervention to save energy in the following areas: Building Envelope/ Electrical systems, Lighting Systems, Heating installations, Cooling systems, Thermal insulation in industry		2011 (1)
	Natural Lighting – Design and Energy Conservation Strategies	Engineers and other technicians working on buildings and internal space design	20	N/A	Natural and artificial lighting (Definitions), openings design – geometry size – glazing options – selection of interior materials etc, levels of natural light measurement, simulation tools		2011 (1)
	Ecological Construction	Hydrothermal Installations technicians Boilers' technicians	44	N/A	Ecological constructions (construction-works, buildings, open spaces, energy, water, noise, domestic waste, etc.). Quality construction, health, safety, resources and energy saving, indoor air quality, selection of appropriate building materials, energy performance of building materials (LCA), new clean technologies, legislation, certification of building materials		2011 (1)

KDVM LEVEL II CENTRE GSEVEE	Automation Housing IBA - Industrial Automation PLC for Electrical Installers	Electrical installers	40	18	Introduction to PLC- PLC advantages – Principal operation of PLCs. Connected PV Systems: operation and troubleshooting. Interface methods. PV frames-mounting-electric accumulators (batteries)-Charge Controllers Battery-power-conversion systems Electronic systems control, protection and other data-loss. Autonomous PV: Methodology of energy power plant needs addressed a standalone PV system-hybrid systems-Incorporating PV to buildings- PV operation problems on buildings	Attendance certificate	2006 (3) 2007 (2) 2008 (6) 2009 (8) 2010 (2) 2011 (0) 2012 (0)
	Photovoltaic systems for electrical contractors		40	149	Energy power. Voltage-amperage. DC power. Sun-wind. Climatic conditions (geographical area, orientation, slope shading potential solar - wind). Photovoltaic effect, solar cell (types)		2008 (1) 2009 (2) 2010 (5)
	Internal electrical installations control for electrical contractors		20	20	Electrical Installations - The New Legislative Framework For Checking Electrical Installations - Control System		2007 (1)
	Substations - Measurements for Electrical Contractors Installers		20	51	Building construction, electricity substations - Medium voltage power, protection cell medium voltage, medium voltage fuses, calculations, measurements, practice in medium voltage substation		2006 (2) 2008 (1)
	Photovoltaic systems for Electrical Installers		25	649	Introduction to renewable energy (solar thermal, solar electric, wind, wave, geothermal) - Electric energy, voltage-amperage, DC power, isolated large-scale producers (MICRO GRID), cross-linked derivatives, Photovoltaic effect, solar cells (type) solar panel, photovoltaic clusters calculation of energy needs housing size of installed power	Attendance certificate of CVET training	2010 (5)
	Foundational Ground - Lightning Protection for Electrical Installers		30	154	Ground connection system of electrical installations. Types of grounding systems, foundational grounding. Advantages - properties Design of foundational grounding criteria, requirements, main - additional histo-dynamic connection, grounding design computer systems. Specific requirements, watertight		2007 (3)

					grounding in building, routing, criteria, requirements. Materials used in the construction foundational ground. Construction foundational grounding extension foundational ground. Significant construction details, fundamental grounding of medium voltage substations. Generally about lightning, calculation of lightning dimensions, materials used in their construction. Internal lightning protection methods, materials, protecting electrical - electronics - structured cabling systems. Harmonics networks, methods of production, means of protection, practical examples, improving power factor		
	Natural Gas for Foremen - Electrical Contractors		150	42	Gaseous fuels, combustion gases burner gas, gas equipment maintenance		2005 (4) 2004 (3)
KDVM LEVEL II CENTRE GSEVEE	Updating Electrical Installers to the new ELOT HD384 certification protocol		20	1556	Introducing the new ELOT HD 384 certification protocol- Protective measures for safety- Choice and installation of electrical equipment Facilities in areas with special requirements – Installation control	Attendance certificate	2006 (22) 2007 (45) 2008 (4) 2009 (12) 2010 (3) 2011 (1) 2012 (0)
	Steel & copper pipe welding methods for gas installers plumbers and air conditioning	Plumbers	25	16	Overview welds, arc welding Oxygen-welding		2009 (1)
	Underfloor heating and cooling for thermal plumber and air conditioning installers		40	95	Central heating system Calculations - options - specifications Innovations - solar Legislation - analysis - boiler burner types		2009 (2) 2010 (2)
	Building central heating for licensed plumbers		40	44	Mechanical calculation – study of geothermal energy -introduction to central heating in buildings-information on fuel and other sources of thermal energy –local heating		2009 (2)

KDVM LEVEL II CENTRE GSEVEE	Pools - Desalination - Biological Treatment for licensed plumbers		40	23	Study of biological equipment - study and construction of swimming pools -swimming equipment tanks - water treatment methods		2009 (1)
	Natural gas devices for cooling installers		40	32	Fuel gas -natural gas- gas appliances transport - delivery – storage of gases -indoor plants -burner - boiler		2009 (2)
	Tele-heating for thermal plumber and air conditioning installers		40	36	Introduction to tele-heating– Tele-heating installations		2007 (2)
	Electro Hydraulic automations						
	Finding and resolving faults of cooling systems for cooling installers.	Cooling installers	30	15	Damage compression system, reciprocating, centrifugal, screw. Damage centrifugal compressor unusually high temperature. Screw-shaped lesions compressor, single screw. Damage reciprocating compressor, insurance overpressure. Damage reciprocating compressor, single phase motors		2010 (1)
	Welding metals - Legislative framework - Safety issues for cooling installers		30	16	Legislative framework –cooling licenses - Welding metal- Hygiene and safety		2010 (1)
	New technologies on cooling installations for cooling installers		90	68	Automated cooling – air conditioning Legislative framework Hygiene and safety		2006 (1) 2007 (2)
	Cooling & HVAC Automation for cooling installers		50	33	Description of a cooling machine. Elements of thermodynamics. Control systems. Automated systems. Defrost mechanisms - Automatic heat (heat pumps) - Basic parts automation system		2007 (2)
	Industrial Cooling & Air Conditioning for cooling installers		50	14	Development / industry prospects. The importance of industrial cooling and air conditioning systems. Basic parts of an industrial cooling and air conditioning		2007 (1)
	Gases and fuels for Fitter burner and boiler maintenance technicians	Burner/boiler installers	150	78	Basic parts of the automation system Starting single phase compressors start winding. Wiring electrical circuits single phase compressor startup. Automation startup of		2008 (2) 2010 (2)

					single-phase motors. Starting devices three-phase compressor cooling.		
	Appliances - Burner combustion gas for fitter burner and boiler maintenance technicians		150	24			2010 (1)

Annex IV: Indicative CVET seminars for EE and RES training from private organizations[1]

Training Provider	Title	Date	Duration (hrs)	Aim/Basic modules	Target Group
TUV HELLAS	ISO 50001:2011 - Principles of Energy Management Systems	1/2012	16	Analysis of key concepts of Energy Management, Energy Management Legislation, Basic Principles of an Energy Management System, Explanation of the Standard Requirements for both the design and internal / external inspection of an Energy Management System	Engineers and technicians
TUV HELLAS	Effective management & energy saving	2/2012	16	Methodology to extract data of energy consumption, energy efficiency indicators to describe the current situation and identify potential savings/ Energy, Energy Monitoring and Data Analysis / Energy Audits, Energy Saving Methods, Economic evaluation of energy investments	Engineers, Technical Managers, Maintenance Managers, designers, engineering offices and construction companies and technicians dealing with energy issues
TUV HELLAS	Building Materials - New Regulation 305/2011EU	10/2012	8	basic principles of EU legislation on construction products (Directive 89/106/EEC and Regulation 305/2011) and description the new legislative framework Products CE Labelling, Introduction to Eurocodes, EU Directive 89/106/EOK- Regulation 305/2011, Certification and Compliance Statement	Consultants, Technical Companies, Producers of construction products, Consultants, technicians
TUV Hellas	Design & installation of PVs in domestic and industrial buildings	10/2012	16	Study, design, installation, maintenance, supervision and sustainability of investment for small, medium and large scale PV systems	Engineers, electricians and PV installers
TÜV Rheinland Hellas	Study of PV systems and Certifications	9/2012	18	PV systems concepts, calculations for autonomous, hybrid and grid connected systems, legislation, standards EN-IEC 61215 EN-IEC 61646 IEC 61730-1 IEC 60634; certification of installations according to EN 62446	Engineers, technicians, PV installers
TÜV Rheinland Hellas	Design and certification of PV installations	9/2012	10	knowledge acquired to design and oversee the construction of small and medium scale PV systems	Engineers and PV installers

[1] www.semifind.gr, http://career.duth.gr

TÜV Rheinland Hellas	Guide for building energy audits	6/2011	16	Building energy audits. Laws and regulations on energy audits, building autopsy, KENAK software, Certificate on energy efficiency	Engineers and technicians working in the field of energy audits of buildings.
OIKONOMOTEXNIKH SEMINARS A.E.	Heating - air conditioning – gas installations in industry and buildings	5/2012	12	Design principles of natural gas facilities, air conditioning technologies with natural gas, reviewing existing experience on projects in Greece and abroad	Industry engineers, electromechanical installations contractors, technicians working with natural gas plants
OIKONOMOTEXNIKH SEMINARS A.E.	PV systems theory, practice, laws, construction & simulation	4/2012	12	Critical parameters regarding the calculation, design and implementation of a PV system, Financial & market trends, Major aspects of the Greek legislation on PV systems, Basic principles of PV system operation	Engineers and PV installers
OIKONOMOTEXNIKH SEMINARS A.E.	Green concrete - Green buildings - Energy building design	4/2010	5	Terms and conditions to optimize the energy performance of existing buildings - and the design of new, analysis of key parameters taken into account in building design, key legislation associated with energy building design. Impact on environment due to climate change, Sustainable construction => Environmentally friendly concrete (Green concrete), Life cycle of construction	Engineers, Technical Managers, Maintenance Managers, designers, engineering offices and construction companies and technicians dealing with energy issues on buildings
OIKONOMOTEXNIKH SEMINARS A.E.	Innovations in the design and construction of buildings; using new materials eco- friendly	10/2010	12	Innovative materials and eco-friendly technologies for the building, evaluation and costs comparisons to conventional materials	Engineers, construction companies, technicians
OIKONOMOTEXNIKH SEMINARS A.E.	Installation techniques for PV plants	6/2012	12	Design and implementation of a PV system, financial & market trends, major aspects of the Greek legislation on PV systems, and basic principles of PV system operation	Engineers and PV installers
OIKONOMOTEXNIKH SEMINARS A.E.	Lighting for Public Spaces		N/A	Lighting in public places. Rules, regulations and techniques that contribute to the integrity of such planning, Appropriate solutions for the selection of appropriate lamps and lights	electricians, technicians, engineers

OIKONOMOTEXNIKH SEMINARS A.E	Shallow Geothermal Systems and the new institutional framework		N/A	New practices for air conditioning (cooling-heating) like the shallow geothermal energy Legislative framework, Types of Geothermal Systems & Selection, Geothermal Heat Pumps, Dimensioning, Description of the geothermal air conditioning, Examples	Engineers and technicians who work on RES and air conditioning of buildings
OIKONOMOTEXNIKH SEMINARS A.E.	PV technology – Financing	3/2010	N/A	PV technology and applications PV Systems, Typologies, Systems' Design, Installation of PVs, Simulation, Technological Developments, Technological Issues, Financial Legislation in Greece, Ways of Funding, Typical Application Examples in Greece	PV installers and potential investors
OIKONOMOTEXNIKH SEMINARS A.E.	Green buildings - Energy design: from the bioclimatic to the zero energy consumption building	4/2010	10	Terms and conditions to optimize the energy performance of existing buildings - and the design of new. Analysis of key parameters taken into account in building design; key legislation associated with energy building design.	Engineers and technicians dealing with the design of building.
OIKONOMOTEXNIKH SEMINARS A.E.	New Building Regulation (N.O.K.) L. 4067; 79A/9-4-12	9/2012		New building regulations which replaced GOK/85 (L.1577/85), labeling changes and familiarity with the new structure (philosophy) the new law.	Engineers and technicians
OIKONOMOTEXNIKH SEMINARS A.E.	Design of PV on roofs up to 100 kW & lightning protection (connection to PPC)	3/2012	6	Sizing of PV systems on roofs up to 100 kWp, required Lightning Protection, for connection to low voltage grid The PV system, PV system design, Installing PV system, Lightning Protection of the PV, Lightning Protection of Buildings, Earthing, Examples	Electricians, technicians, PV installers
OIKONOMOTEXNIKH SEMINARS A.E.	Applied maintenance in hospitals cost reduction and	5/2012	N/A	Efficient maintenance of the equipment found in hospitals, Regulations and standards governing the maintenance, analysis of specific technical issues;	Technical Services staff of hospitals.

	energy saving			Energy Saving Strategies in hospitals; methods of maintenance; Special topics in electrical installations in hospitals; oil or gas boilers, oil and gas; burners; pumps and circulators; power generators and transformers; lighting, gas supply	
OIKONOMOTEXNIKH SEMINARS A.E.	Lighting and Energy Saving with new technology LED lighting	4/2011	5	How to save energy using LED lighting / key definitions and lighting specifications; design criteria and calculation of lighting; led selection; applications; investment criteria	Electricians, architects, interior designers
OIKONOMOTEXNIKH SEMINARS A.E.	Thermography for Building Diagnostics	5/2011	5	Use of thermography for fast, efficient and reliable diagnosis of energy and construction problems	Engineers / technicians who work in the field of energy audits; electricians air conditioning technicians and technicians in charge of electromechanical maintenance.
Euro educational	Application of CHP systems in buildings and industries	6/2011	5	Combined Heat and Power (CHP), Trigeneration plants for covering electrical, thermal and cooling loads for buildings and industry Feeding CHP units with gas fuels CHP and electricity distribution networks, Environmental aspects, framework for CHP in Greece Sizing CHP systems Economic evaluation of CHP plants Examples	Engineers, building maintenance managers
Euro educational	Study & design of low voltage electrical installations	8/2012	12	Requirements of ELOT 384 standard for low voltage electrical installations and relevant legislative framework Selection and installation of electrical equipment, discrimination, selectivity, Cascading, backup protection between the protective devices	Engineers, technicians and electricians
Euro educational	Design Analysis of PV systems	1/2011	12	Design, installation and maintenance of PV installations, equipment selection, sizing, efficiency and minimization of shadows. Grid connected and stand-alone systems.	Engineers and PV installers
Euro educational	Guide for building energy audits	1/2011	6	The process of developing energy efficient building design according to KENAK	Engineers and technicians
Euro educational	Economic evaluation of	4/2010	6	Simplified calculation methods for the economic evaluation of any energy saving intervention	Engineers and technicians

	energy saving interventions: 32 case studies				
Euro educational	Energy audits of the building envelope	3/2010	12	Energy Audits, introduce the concept of KENAK; energy measurement methodology, analysis of energy efficiency in buildings; energy certificate	Engineers and technicians working in the fields of energy saving in buildings
Euro educational	Energy Conservation for Hotels	3/2011		Energy saving measures in the hotels industry. Optimizing the energy performance of existing hotels and designing new energy-efficient hotel facilities	Engineers and technicians working in the field of design and maintenance of hotel facilities
CAD studies	Energy Study & Audit	4/2011	12	Energy Performance of Buildings Regulation (KENAK), Encoding methodology for studies of Energy Efficiency and Energy Audits.	Engineers and technicians working in the field of energy audits of buildings
CAD Studies	Seminar on bioclimatic design	3/2010	30	Overview of bioclimatic design; thermal and visual comfort reducing energy consumption and harmonize with 2002/91/EC.	Engineers and technicians working in the field
ELKEDE centre of technology and design	Hydrothermal Installations Installation/maintenance of Boilers'	4/2008	200		Hydrothermal Installations technicians, Boilers' technicians
TUV Austria Hellas	Energy Management Systems – EN 16001:2009 & ISO 50001:2011	10/ 2012	18	Requirements of EN 16001 and ISO 50001, so that participants can identify opportunities for improving energy performance, cost savings, reduce greenhouse gas emissions Basic concepts for energy management, energy management legislation; The principles and purpose of an energy management system in accordance with standards EN 16001 and ISO 50001, the relationship between EN 16001 and ISO 50001 with ISO 14001 and other relevant standards	Business executives interested in reducing energy costs, building maintenance managers
Master-D	Solar and Wind Energy	2012	Estimated completion time: 1 year. The study period can be extended up to 3years	3 modules are covered in this course: - PVs - solar thermal energy - wind energy	a) Professionals activating to RES, people installing and maintaining heating systems, electricians, engineers, architects. b) All people interested in RES regardless if they are technicians with or with not any working experience.

Engineering-Intelligence	PV Installation on roofs of buildings	9/2012	16	Analyze and present the aspects related to the proper installation of an PV system on the roof of a building/ building permit procedures for PVS; specifications for PV installation on roof, domestic & industrial roofs; critical points during installation; case study	Engineers from AEI and TEI

BACK COVER

BUILD UP Skills

The EU Sustainable Building Workforce Initiative in the field of energy efficiency and renewable energy

BUILD UP Skills is a strategic initiative under the Intelligent Energy Europe (IEE) programme to boost continuing or further education and training of craftsmen and other on-site construction workers and systems installers in the building sector. The final aim is to increase the number of qualified workers across Europe to deliver renovations offering a high energy performance as well as new, nearly zero-energy buildings. The initiative addresses skills in relation to energy efficiency and renewable energy in all types of buildings.

BUILD UP Skills has two phases:

I. First, the objective is to set up national qualification platforms and roadmaps to successfully train the building workforce in order to meet the targets for 2020 and beyond.

II. Based on these roadmaps, the second step is to facilitate the introduction of new and/or the upgrading of existing qualification and training schemes.

Throughout the whole duration of the initiative, regular exchange activities are organised at EU level to underline the European dimension of this important initiative and to foster the learning among countries.

The BUILD UP Skills Initiative contributes to the objectives of two flagship initiatives of the Commission's 'Europe 2020' strategy — 'Resource-efficient Europe' and 'An Agenda for new skills and jobs'. It is part of the Commission's Energy Efficiency Action Plan 2011. It will also enhance interactions with the existing structures and funding instruments like the European Social Fund (ESF) and the Lifelong Learning Programme and will be based on the European Qualification Framework (EQF) and its learning outcome approach.