BUILD UP Skills – Portugal –

Analysis of the national status quo

October 2012

Further information

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

More details on the IEE programme can be found at http://ec.europa.eu/intelligentenergy

TABLE of CONTENTS

0. Executive summary

The Building sector has been severely impacted by the economic crisis currently affecting Portugal. The key drivers responsible for the poor performance of the Building sector in the country were reduced production, weak corporate consolidation and low productivity, as witnessed by the following indicators:

- Significant drop in production, geared by the residential segment, marked the 2001-2011 decade;
- The Portuguese Building market shows a low level of consolidation and the five largest construction firms have a market share of only 13 percent, much lower than the European average (i.e. 23 percent in 2007);
- Average productivity in the national building sector is significantly lower than the European average, as the GVA per employee in Portugal is €22,000, against the European average of €63,000.

Accordingly evolution in the Building sector will foreseeably be marked by retracted public and private investment. Government, companies and households find it difficult to obtain credit, there is a surplus offer of building stock (housing and services) and the evolution of the international markets is highly uncertain.

Notwithstanding this context the adopted National Strategy on Energy (ENE 2020) includes a set of measures aimed at re-launching the economy and fostering employment, investing in technological research and development and increasing Portugal's energy efficiency. In terms of national employment, it is expected to produce the following results by 2020:

- Consolidate the cluster associated with renewable energy sources in Portugal, so as to ensure, by 2020, a Gross Value Added (GVA) of 3.8 billion Euro and the creation of another 100 thousand jobs (in addition to the sector's existing 35 thousand).
- Continue to develop the industrial cluster associated with the promotion of energy efficiency, securing the creation of 21 thousand jobs, generating an investment of 13 million Euro up to 2020 and yielding extra exports amounting to 400 million Euro.

Renewable energy sources are therefore a sector with a high growth potential, which must absolutely be accompanied by a training strategy capable of fulfilling this sector's needs. Moreover renewable energies have been considered a sector with a potential for creating green jobs.

A review of the level of energy certification in buildings showed that there are currently about 500 thousand buildings certified with the Energy Certification System (SCE), of which 100,000 are at the design phase and the remaining 400,000 are existing and recently-constructed buildings for which a Statement of Conformity (DCR) has been issued. Property built for housing purposes continues to lead, representing 90 percent of the SCE certificates issued.

Existing buildings have a low energy efficiency level, compared to new buildings. Notwithstanding existing buildings have a high potential for improving their energy efficiency as, in addition to traditional retrofitting, they may adopt energy efficiency improvement measures. Demands imposed by the thermal regulations on buildings currently in force have triggered a remarkable improvement of energy efficiency in buildings, although other improvement measures can still be considered.

Electricity is, in terms of energy use, the largest component of energy consumption in the household and services sectors. In the household sector there is also a significant use of firewood and plant residues, as well as LPG (butane and propane). In services the natural gas and heating gas oil have some importance, after electricity. Reference should be made to the fact that 50.2 percent of electricity used is obtained from renewable energy sources (RES), according to the calculation methodology set out in Directive 2001/77/CE.

One of the objectives of the European strategy consists in increasing, up to 2020, the number of professionals in the building sector with the qualifications required to optimise the use of renewable energy sources and improve energy efficiency in buildings. Therefore one of the goals of this report is to establish a set of well-structured systematic data enabling a broader discussion with Portuguese stakeholders with a view to designing a national training roadmap capable of improving the

competences of building-sector workers and installers in the fields of energy efficiency and renewable energies.

In order to review employment in activities of the building sector which are the target of this study, we only considered in this context those occupations potentially contributing to higher energy efficiency – this work's actual objective. Thus, as regards employed persons listed in 2009 (last data available in national statistics) for the selected economic activities and occupations, we find out that, out of a total 100,850 workers, 41 percent are masons (41,408 workers). The remainder are markedly scattered among other occupations in the sector, ranging from 0.01 percent (Prefab [masonry] machine operator) and 9 percent (Construction supervisor and Carpenter). As regards the training background, data show that 86 percent of these workers have completed basic education and 6 percent secondary education.

We also looked into the way in which the national qualifications system is structured and meets the workers' needs for competences and qualifications. We reached the following general conclusions:

- There are regional asymmetries in the offer of training, as regards both qualifications and the modalities of education and training;
- Higher investment has been made in training associated with renewable energies, as regards both the initial qualification of young people and adult qualification (particularly in connection with the installation of solar equipment, either photovoltaic or thermal);
- Sharp drop of adult training in 2011 as regards the EFA education and training modality, in the framework of qualifications associated with the building and energy sector.

One last reference should be made to the continuing training of active workers, for which it was a bit difficult to obtain systematic data – in terms of both certified training (monitoring process currently under implementation) and continuing training exclusively developed by companies and sector-specific certification schemes.

We hope to have more detailed and properly systematic information at the next development stage of this project.

- The number of current workforce in the building sector, in 2009, working in occupations that have a potential contribution for energy efficiency and renewable energies (indicated in table 5.5 of the current report), is 100,850 workers.
- The total energy consumption in Portugal is 22.9 Mtoe and, in the building sector, is 4.9 Mtoe, figures from 2010. On site generation of RES in the building sector is of about 0.8 Moe.
- For 2020, a decrease of 7.5 Mtoe in primary energy, comparing with the energy demand projection of PRIMES model from European Commission is expected; residential and service sectors contribute for the decrease in 0.470 Mtoe of final energy.
- Improvements in qualifications design and also on the training schemes are needed, namely:
  Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources (Gas technician; HVAC Systems Technician);
  Integration of wind systems installer with photovoltaic systems installer to assign double qualification;
  Integration of bioenergy installer with solar thermal installer to assign double qualification;
  Make possible an upgrade for solar thermal installer and bioenergy installer
  Make possible an upgrade for wind and photovoltaic systems installer (Electrical technician; Electrical Installation; Electrician-Assembler);
  Make possible an upgrade for solar thermal installer and bioenergy (plumber; Cold Storage and Climatisation Technician; HVAC Systems Designer);
  Reinforcement of skills related to plumber occupation (bioenergy installer);
  Energy efficiency related to mechanical ventilation (pipe fitter);
  Applying thermal insulation and correcting thermal bridges (bricklayers);
  Applying thermal insulation (floor layers and tile setter)
  Windows installer other than wood frames (trim carpenter)
  General approach of energy efficiency in construction (Construction supervisors; Draughtspersons; Building civil engineering architectural technician) trainings.

1. Introduction

This report is the first output of a project currently developed at the national level in the framework of the initiative BUILD-UP SKILLS (phase one), financed by the Executive Agency for Competitiveness and Innovation (EACI). Its purpose is to increase, up to 2020, the number of qualified professionals in Portugal capable of optimising the use of renewable energy sources and improving energy efficiency in buildings.

The project is co-ordinated by Portugal's National Laboratory for Energy and Geology, I.P. (LNEG), in close co-operation with the Directorate General for Energy and Geology (DGEG), the Agency for Energy (ADENE) and the National Agency for Qualification and Vocational Training, I.P. (ANQEP).

The specific objectives of this 18-month project are to:

I. **Gather, hear and vitalize all stakeholders** involved in the process of continuing training of building-sector professionals and installers of energy systems, namely regional energy agencies, trade unions and industrial, building-sector and continuing training associations;

II. **Establish a roadmap** for the period up to 2020 and subsequent time frame, with a view to improving the competences and qualifications of building-sector workers and installers of energy systems, both active and non-active;

III. **Muster the support** of the largest possible number of stakeholders to the national training strategy up to 2020, to be materialised by creating a national platform for qualification.

The BUILD-UP SKILLS Portugal project consists of a set of working packages (WP). This report is the result of WP2 – State of the Art Review, which aims to quantify offer and demand of professionals qualified in renewable energy sources and energy efficiency in Building sector, as well as to identify qualification needs and barriers preventing the number of qualified professionals in this sector from growing.

2. Objectives and methodology

The purpose of this report – State of the Art Review of Training on Renewables and Energy Efficiency in the Building Sector – is to produce information that can be used as starting point for sustained discussion among the sector's stakeholders in order to identify current gaps, future needs and action priorities regarding the qualification of building sector's professionals and installers of energy systems.

Accordingly the report has been divided into four large sections:

- Characterisation of Portugal's building sector and national policies in the fields of energy and education & training (chapters 3 and 4);
- Review of the building sector's statistics, including employment (chapter 5);
- Review of the training offer incorporated into the National Qualifications System, as well as the offer promoted in the framework of sector-specific certification schemes (chapter 6);
- Identification of skills gaps, considering the present training offer and the labour market needs (chapter 7);
- Identification of barriers impeding the qualification of the sector's professionals, which may compromise compliance with the targets set out in strategy 2020 (chapter 8).

The methodology adopted for designing this report essentially consisted in collecting existing data (studies, working documents, websites, etc.) and involving a number of stakeholders in the process.

Data used for drafting part one of the report – *Characterisation of Portugal's building sector and national policies in the fields of energy and education & training (chapters 3 and 4)* – were collected from studies and other national and international papers, as well as legislation currently in force in the field of Construction, Energy Efficiency and Renewable Energies.

For drafting part two of the report – *Review of the building sector's statistics, including employment (chapter 5)*, we used published data, but we also requested new data from the National Institute of Statistics (INE), the Strategy and Planning Office of the Ministry of Solidarity and Social Security and sector-specific information regarding employment in the Building sector, as a function of our selection of a group of economic activities[1] and a group of occupations[2].

In what concerns part three of the report – *Review of the training offer incorporated into the National Qualifications System, as well as the offer promoted in the framework of sector-specific training schemes (chapter 6)* – we used the following information sources:

- SIGO – Information and management system for the educational & training offer (Science Ministry);
- Institute for Employment and Vocational Training (data on Learning Courses);
- Directorate General for Energy and Geology [DGEG] (data concerning training developed by entities certified by DGEG).

In the identification of skills gaps we consider the result of the meetings with stakeholders and the information obtained through other experts analysis.

Lastly we took into account, for drafting the final part of this report, which should deserve increased attention – Identification of barriers impeding the qualification of the sector's professionals, which may compromise compliance with the targets set out in strategy 2020 (chapter 8), not only the entire bulk of reviews and conclusions of previous chapters but also the results yielded by a survey made to a diversified number of stakeholders.

In fact stakeholder involvement constituted a key driver for the success of this work. At this stage this involvement essentially materialised itself along two strands:

The working group held four meetings with a widely diversified set of entities, which formalised their support to its work right from the onset of the project, namely:

- Association of Manufacturers and Importers of Burning Equipment (AFIQ)

[1] Based on the Portuguese classification of economic activities (CAE) Rev. 3.

[2] Based on National Classification of Occupations (CNP) 94.

- Portuguese Association of Cold-Storage and Air-Conditioning Engineers (EFRIARC)
- Vocational Training Centre for the Thermal Industry, Energy and the Environment (APIEF)
- Portuguese Association of the HVAC Industry (APIRAC)
- Institute for Welding and Quality (ISQ)
- Association for the Certification of Electrical Facilities (CERTIEL)
- Entrepreneurial Association of the Sectors of Electricity, Home Appliances, Photography and Electronics (AGEFE)
- Institute for Construction and Real-Estate, I.P. (INCI)
- National Union of Industry and Energy (SINDEL)
- National Association of Efficient Window Manufacturers (ANFAJE)
- Portuguese Association of Construction Material Sellers (APCMC)
- Portuguese Association of the Solar Industry (APISOLAR)
- Vocational Training Centre of the Building Industry of Northern Portugal (CICCOPN)
- Portuguese Federation of the Building Industry (FEPICOP)

The working group made four surveys addressed to companies (Type I), entrepreneurial or industrial associations, trade unions and professional associations (Type II), training providers (Type III) and others (Type IV). The purpose of these surveys, in view of the national objectives of improving energy efficiency and the use of renewable energies in buildings, was to:

- Ascertain whether workers have the appropriate qualifications at each phase of intervention in buildings;
- Provide access to information;
- Acknowledge training needs and priorities;
- Match the training offer with the training needs;
- Identify constraints and barriers impeding training.

The sample used for preparing this report consists of a total 29 responses to the surveys, subdivided into each group, as follows:

- Type I: 16
- Type II: 9
- Type III: 3
- Type IV: 1

This report, consisting of a State of the Art Review of Training on Renewables and Energy Efficiency in the Building Sector, aims to establish a set of well-structured systematic data enabling a broader discussion with Portuguese stakeholders with a view to designing a national training roadmap capable of improving the skills of building-sector workers and installers in the fields of energy efficiency and renewable energies.

3. Characterisation of the building sector

3.1. Background to the building sector

According to a study made by THAMES Consultores[3], the 1975/1985 decade was marked by post-revolutionary instability and long-lasting economic crisis due to the oil price growth. As a result of these drivers, together with the recommendations made by IMF (International Monetary Fund) missions, the State Budget appropriated insignificant amounts for government investment and operators licensed to produce and distribute energy, gas, water and communications.

Upon Portugal's accession to the European Communities in 1985, the country's Gross Domestic Product (GDP) amounted to a mere 55 percent of the average member nations (2,275 €, at current prices[4]). Portugal's huge infra-structure backwardness was identified as one of the key obstacles to its development. From 1985 to 2003, investment in infra-structure construction grew at an annual rate higher than 18 percent – reaching a maximum 2,747 million € in 2001.

In addition to the above infra-structure projects, after 1995 the building sector was impacted by the prospects that Portugal could meet the requirements for joining the first group of member states adopting the single currency. This triggered a process of swift reduction of the interest rates.

The marked reduction of the price of money, within a short lapse of six years, made it possible for large segments of the population to buy a house. Mortgage loans granted by all banking institutions in the market caused the accumulated amount to grow from 9,421.7 million € in 1993 to 42,122.9 million € in 1999[5], corresponding to an annual growth rate higher than 25 percent.

This growth of the real-estate sector had a tremendous impact on the building industry, due both to the increased production turnover and the raise of unitary prices per square metre. The real-estate boom, the large investments in infra-structure and the construction of Expo-98, all at the same time, led the sector to reach the highest peak in its entire history between 1998 and 2001.

Nevertheless after reaching its historical peak of 2001, Portugal's building sector has since reduced its activity at a rate of 4.5 percent per year. From 2002 onwards, the financial crisis of the government, on the one hand, and the saturation of the real-estate market, on the other, have caused the building industry's production to constantly drop. Between 2002 and 2006, the sector's Gross Value Added (GVA) has dropped by 22.44 percent.

The first half of 2011, according to the Institute for Construction and Real-Estate, I.P. (InCI)[6], marked the beginning of the process of adjustment of the Portuguese economy, which has been characterised by the implementation of strongly restrictive fiscal policy measures and the re-allocation of economic resources.

This process was triggered by the request for assistance made by Portugal to the European Union and the IMF in April 2011, thus avoiding an imminent situation of non-compliance of the Portuguese State vis-à-vis its creditors.

Today the Portuguese economy faces a significant contraction of domestic demand and a slow-down of exports, which have affected the country's growth. This driver has consequently influenced both public and private investment, due to high levels of uncertainty as to the correction of macro-economic imbalances.

[3] THAMES Consultores (2008), O Sector Construção em Portugal.

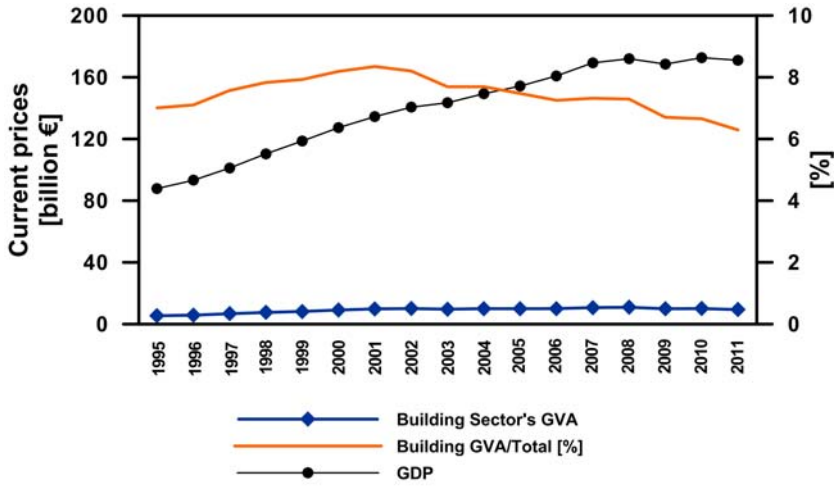
[4] www.pordata.pt.

[5] Banco de Portugal and Caixa Geral de Depósitos.

[6] InCI (2012), Relatório Semestral do Setor da Construção em Portugal, First Half of 2011.

3.2. The building sector and Portugal's economy

The Portuguese economic crisis has caused a slow-down of the GDP. After a period of four consecutive years of annual growth, 2008 was marked by a zero variation, followed by a 2.5 GDP drop in 2009. Economic activity recovered slightly in 2010, with a 1.4 percent growth, but in 2011 it decreased again (Figure 3.1).



Source: INE [National Institute of Statistics], Contas Nacionais.

Figure 3.1 – Variation of the Gross Valued Added in the Building Sector versus the Gross Domestic Product.

The importance of the Building sector for the Portuguese economy has decreased since 2001; in 2009, this sector's production represented 9.6 percent of national production (Table 3.1). As regards the GVA of this business sector, 2011 data show that it represents 6.29 percent of total GVA, which is in line with the European average (6.5% in 2008[7]).

In 2011 the GVA of the Building sector dropped significantly, with a variation rate in terms of value over the same quarter of the previous year amounting to -6.9 percent, -9.7 percent and -11.4 percent respectively in the 2nd 3rd and 4th quarter. It should be stressed the the Building sector's GVA was the main responsible for the slow-down of Total GVA, together with Agriculture, Forestry & Fisheries, Energy, Water & Basic Sanitation and Other Activities & Services.

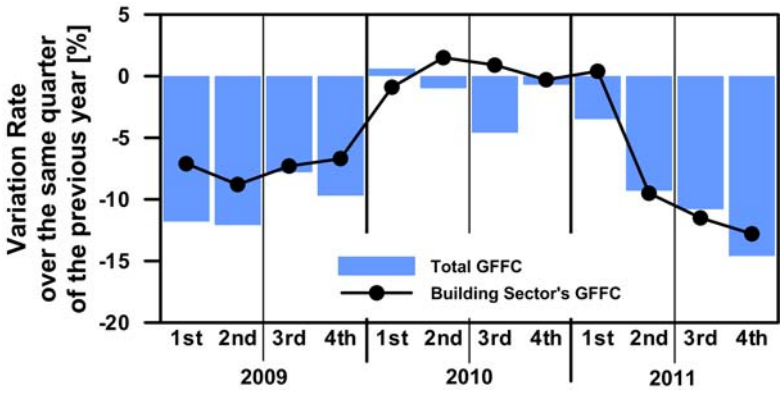
Table 3.1 – Evolution of production in the Building sector at current prices comparatively to national totals.

YEAR	BUILDING [million €]	TOTAL [million €]	[% TOTAL]
1995	17.297,9	168.572,7	10,3
1996	18.960,0	179.553,7	10,6
1997	22.424,1	194.991,2	11,5
1998	24.883,0	209.535,1	11,9
1999	26.217,4	221.025,0	11,9
2000	28.947,9	241.415,9	12,0
2001	30.902,2	255.077,1	12,1
2002	31.711,1	260.681,5	12,2
2003	30.320,1	263.894,6	11,5
2004	31.999,8	276.474,7	11,6
2005	32.796,8	287.332,0	11,4
2006	32.236,7	298.573,4	10,8
2007	32.492,5	317.575,6	10,2
2008	33.019,4	330.273,3	10,0
2009	30.037,7	311.364,6	9,6

Source: INE, Contas Nacionais.

[7] InCI (2009), Análise da evolução do Mercado Nacional de Construção, Relatório Final.

According to Portugal's National Institute of Statistics (INE)[8], the Gross Formation of Fixed Capital (GFFC) showed a negative behaviour in the last quarters of 2011, with a negative variation rate higher than 10 percent over the same quarter of the previous year.



Source: INE, National Quartely Accounts.

Figure 3.2 – Gross Formation of Fixed Capital (Total and in the Building Sector).

In turn GFFC in the Building sector accompanied the trend of Total GFFC in 2009 and 2010, although with a less marked oscillation. It should be noted that in Quarter 3 of 2010, Total GFFC was the highest recorded in that year – and, conversely, the second lowest in the Building sector. As from Quarter 2 of 2011, variation has none the less been similar for Total GFFC and the Building Sector's GFFC.

Lastly reference should be made to the fact that the Building sector consists of three large segments, i.e. government contracts, the residential sector and the non-residential sector, respectively representing 29, 45 and 25 percent of total production (estimated data for 2011)[9]. Each segment in the building sector is subdivided into diferente subsegments, be it new buildings be it retrofitting, grouped into:

- **Services (non residential)**: offices, commercial buildings, industrial buildings, education, health, storage and others;
- **Government Contracts**: roads, railroads, other transportation, telecommunications, energy, water and others;
- **Residential**: domestic use.

According to the Roland Berger Strategy Consultants' study published by InCI[9], in the last decade the decreased production of the Building sector resulted only from a sharp reduction of the residential segment and the non-residential may have even recorded a slight growth trend.

Economic growth and employment variation in Portugal over the last few years have been higher than in the Building Sector, indicating that its importance for the national economy has gradually decreased.

3.3. Main players in the building market

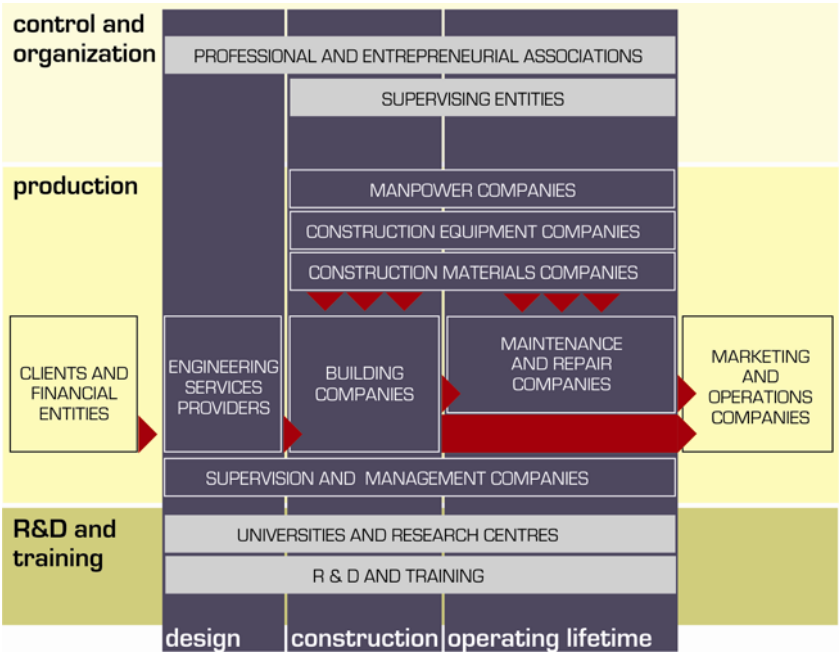
The building industry has a widely diversified offer in each type of market of the economy and is therefore an important job generator. The building industry is composed of many markets, as follows:

- classic markets (transport, public services, housing, industry, etc.);
- recent markets (shopping centres, tourism & leisure, telecommunications, school & prison retrofitting, etc.);
- future markets (telework, renewable energies, maintenance, recycling).

Figure 3.3 contains data that inform us on the key players in the Building market, including buildings. We must stress that special facilities operators (i.e. HVAC, electricity, telecommunications, special

[8] INE, National Quarterly Accounts.
[9] InCI (2009), Análise da evolução do Mercado Nacional de Construção, Relatório Final.

equipment, etc.) should be given a specific place in the figure, as independent entities separate from building companies.



Source: Martins, C (2009), Sistema de Regulação da Atividade da Construção em Portugal, Final Master's Degree in Civil Engineering Report (IST).

Figure 3.3 – Key in the Building market.

The government body in charge of regulating the building market is the Institute for Construction and Real-Estate, I.P. (InCI), created by Decree-Law no. 144/2007, of the 27 April. Reporting to the Ministry of the Economy and Employment, InCI has the mission of regulating and supervising the building & real-estate sector, vitalising, supervising and regulating all activities developed in this sector, producing statistical data and sector-specific reviews and ensuring the government's co-ordinated intervention in this sector.

3.4. Market trends and outlook

Economic activity in Portugal, using InCI as source[10] and taking stock of the situation at the global level, is also going through a severe contraction and no recovery can be predicted for the time being, so more so that recession signals have not ceased to exist. In fact the largest economies continue to be seriously affected by instability in the financial markets and also by the increasingly difficult situation in the European Economic Area.

For the above reasons the building sector, as a rule critically sensitive and an indicator par excellence of the Portuguese economy, is marked by a significant activity break, particularly in terms of turnover – hence its lowered contribution to national investment and job creation.

Another datum to reckon with is the number of bankruptcies in the building sector, corresponding to approximately 18 percent of all bankruptcies recorded nationwide until September 2011.

In this context the prospects for the building sector in Portugal in 2012 and subsequent years are not bright, as fiscal policy constraints will require cutbacks in government expenditure and consequently in all investments related to it.

[10] InCI (2011), O sector da construção em Portugal, First Half 2011.

3.5. Key drivers with in impact on the Building Sector

The key drivers impacting on the Building Sector's performance in Portugal, according to the Roland Berger Strategy Consultants' study[11], are a combined decrease of production, weak corporate consolidation and low productivity, as witnessed by the following indicators:

- Significant drop in production, geared by the residential segment, marked the 2001-2011 decade;
- The Portuguese market shows a low level of consolidation and the five construction firms have a market share of only 13%, much lower than the European average (23 percent in 2007);
- Average production in the national building sector is significantly lower than the European average, as the GVA per employee in Portugal is €22,000, against the European average of €63,000.

In short the Building sector will likely evolve as follows:

- Retraction of private and public investment, as the government, companies and households find it difficult to obtain credit;
- Surplus offer in the building stock (residential and services);
- High level of uncertainty as regards the evolution of international markets.

3.6. Migrant work

According to a study published in 2008[12], the percentage of foreign individuals among Portugal's active population amounted to 5-6 percent, roughly 24 percent of which in the Building sector – particularly foreigners from Eastern and Southeast Europe. To these one must add unofficial workers (i.e. without labour contract) who may represent, in the Building sector, approximately 34 percent of the migrant population[13].

Foreign citizens have a stronger presence among the active population of the building sector, together with restaurants and kindred activities, representing nearly 10.5 percent of total population[10] (2004 data).

According to the above study, in what concerns the educational background of the total foreign active population, 18.8 percent have secondary school/vocational courses and 7 percent university bachelor degrees /first degrees. This does not differ significantly from the total active population – i.e. 18.7 percent with secondary school/vocational courses and 10.2 percent with university bachelor degree/first degree. There is however a gap between educational background and qualification level, as 59.3 percent of the foreigners have a semi-qualified, unqualified, apprentice-level or unknown profession, versus 38.5 percent of the total active population for those same levels of qualification. The percentage of foreigners with high educational background but low-to-medium qualified occupations is 36.6 percent (in 2005-2006), much higher than workers born in Portugal, 21.1 percent[14].

3.7. Shadow economy

According to the Observatory for the Economy and Fraud Management (OBEGEF)15, the Hidden Economy in Portugal represented 23 percent of the GDP in 2008. According to the latest data published by the OBEGEF, in 2010 this value would have increased to 24.8 percent, corresponding to roughly 32 billion €.[16].

It should be noted that the Hidden Economy measured by the above study consists of three distinct components, as follows:

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[11] InCI (2009), Análise da evolução do Mercado Nacional de Construção, Relatório Final.

[12] Peixoto, J (2008), Imigração e mercado de trabalho em Portugal: investigação e tendências recentes, Revista Migrações - Número Temático Imigração e Mercado de Trabalho, Abril 2008, n.º 2, Lisboa: ACIDI, pp. 19-46.

[13] Carvalho, L. X. (2007), Os Limites da Formalidade e o Trabalho Imigrante em Portugal, Cadernos OI, 1, Lisboa: Alto Comissariado para a Imigração e Diálogo Intercultural.

[14] OECD (2007), The Labour Market Integration of Immigrants in Portugal, OCDE, Employment, Labour and Social Affairs Committee.

[15] Afonso, O. e Gonçalves,N. (2009), Economia não registada em Portugal, Observatório de Economia e Gestão de Fraude, OBEGEF.

[16] www.gestaodefraude.eu/

- underground economy, unaccounted for due to tax reasons;
- illegal economy, unaccounted for because it stems from illegal activities;
- informal economy, unaccounted for because it is associated with a strategy of survival (or improvement of the standard of living) of households.

This study plausibly assumes that the Hidden Economy associated with the building sector is essentially of the underground or illegal kind. We actually know of no study enabling an estimate for this specific sector of activity.

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

4.1. In the field of energy

4.1.1. National energy policies for complying with the targets of the EU 2020 strategy

National energy policies for complying with the targets of the EU 2020 strategy included the implementation of national action plans on energy efficiency (PNAEE)[17] and renewable energies[18] (PNAER), respectively of 2008 and 2009.

These two plans sum up the national energy policy on energy efficiency and renewable energies, including a number of measures specifically targeted at the buildings sector. We shall describe the most significant of such measures.

Measures proposed under PNAEE for the sector of residential and services buildings may be grouped into three areas of action:

- **Home and Office Renovation**, grouping measures aimed at encouraging efficiency in households and services – i.e. intervention in household equipment (home appliances and lighting), recovery of buildings with rehabilitation needs, intervention in office equipment;
- **System of Energy Certification of Buildings,** grouping measures related with the energy label of buildings, which is mandatory in Portugal for all new and marketed buildings. The goals are to achieve, by 2015, a 10-percent share of the residential with B- energy class or higher and certify approximately half of the services buildings with B- energy class or higher.
- **Renewables on Spot**, grouping a set of measures related with the access to endogenous energy sources in the sector, i.e. encouraging the use of renewable energy sources, to enable by 2015 results amounting to 48,471 toe and installing 1,385,665 m^2 of solar thermal collectors – the last measure also established under PNAER.

The total measures identified in the action plan would make it possible to achieve by 2015 energy savings amounting to approximately 283 ktoe and 139 ktoe, in end-use energy regarding respectively the residential and services sectors.

As framework for efficiency in the Government sector, a Energy Efficiency in Government programme (Programme E3) has been created which consists of four areas of intervention, i.e. Buildings, Transports, Ecological Procurement and, lastly, Public Lighting.

The highest levels of savings concern the energy used in the more than 15,000 locations of Government consumption, which annually use roughly 1.1 TWh of electricity. Electricity, together with liquid and gas fuels, represent a total consumption higher than 360 ktoe of end-use energy. As regards the Programme on Energy Efficiency of Government, in this report it only makes sense to refer the measures directly related with buildings:

- **Energy Certification of Government Buildings**: to encourage the process of Energy Certification of Government Buildings so that it may be used as example to the other building types, thus helping achieve by 2015 savings of 16,401 toe and a 5-percent reduction of consumption (versus the 318,000 toe end-use energy recorded in 2005);
- **Solar Thermal in Swimming Pools**: to install solar thermal systems for heating domestic hot water in swimming pools and bathroom facilities directly run by government bodies, or in private-owned swimming-pools linked to public service, totalling 285 swimming-pools up to 2015 (with energy savings of 4,561 toe);
- **Solar Thermal in Sports Facilities**: to install solar thermal collectors in buildings that are part of sports facilities (i.e. bathroom facilities supporting gymnasiums and other sporting venues) for heating domestic hot water. We expect a penetration of 80 percent of this measure into the

[17] Cabinet Resolution no. 80/2008, Plano Nacional de Acção para a Eficiência Energética (PNAEE), Portugal Eficiência 2015.
[18] Plano Nacional de Acção para as Energias Renováveis (PNAER), 2009.

existing bathroom facilities, which may technically accommodate this equipment and yield savings of 1,576 toe generated by approximately 700 facilities;

- **Micro-generating School**: to install approximately 2,500 systems of electricity micro-generation until 2015 in public schools where such installation is technically feasible (solar, micro-wind or other use). This may generate savings of about 1,613 toe by 2015, resulting from the installation of a roughly 15 MW capacity in 2,500 schools identified as target for this measure.
- **Hospital Co-generation**: to create power-generation units in small-to-medium size hospitals, enabling the endogenous production of electricity and heat for partially meeting the electric and thermal requirements of hospital buildings in an economically feasible fashion. The total 20 co-generation systems, yielding savings of 2,137 toe, correspond to approximately one fifth of the hospital units considered.

Taking into account the current economic juncture the macro-economic scenarios for the period up to 2020 have been reviewed, resulting in a marked reduction of the estimated energy consumption vis-à-vis the PNAEE and PNAER forecasts. These two, for this reason, may be reviewed.

4.1.2. Summary of activities scheduled for implementing the EPBD Recast Directive and the Renewables Directive

As regards the activities scheduled for implementing the EPDB Recast Directive, Portugal is currently amending the regulations of the National System for the Energy and Indoor Air Quality Certification of Buildings (SCE), which will be published in the end of June 2012. This review will include the adoption of more demanding rating criteria of the buildings rating system.

Activities scheduled in the Renewables Directive are listed on PNAER. The most relevant for the buildings sector are the Renewables on Spot programme (described above) for the electricity area and the investment in de-centralised generation systems either for DHW production or climatisation, using solar thermal systems, biomass-fed boilers or heat pumps.

It should be noted that district heating systems, in view of Portugal's climate, would have very low levels of utilisation and would not be economically viable.

Reference should also be made to the fact that Portugal is involved in a joint European action for implementing the Renewable Energies Directive (2009/28/EC) called CA-RES (www.ca-res.eu), which addresses the thematic of Energy in Buildings, issues related to the Certification of installers of Renewable Energy systems and also issues related to general information on Renewable Energy Sources and their benefits. Portugal's involvement in CA-RES is closely associated with the Build-up Skills initiative.

4.1.3. Relevant legislation in the buildings sector

The National System for the Energy and Indoor Air Quality Certification of Buildings (SCE), which is intended to provide significant energy savings, is one of three foundations on which is based the legislation governing the thermal quality of buildings in Portugal. The SCE, together with the bills passed to revise the technical regulations applicable in this framework to residential buildings (RCCTE[19]) and services buildings (RSECE[20]), sets out the rules and methods required to monitor the actual enforcement of such regulations to new buildings, as well as to the already existing buildings stock at a later stage.

The RCCTE establishes quality requirements applicable to new residential buildings and small services without HVAC systems, namely as regards the characteristics of the envelope (walls, glazing, pavements and roofs), in order to prevent thermal losses and control surplus solar gains.

This regulation imposes maximum energy consumption levels for climatisation and domestic hot water production, clearly encouraging the use of efficient systems and lower-impact energy sources in terms of primary energy consumption. This regulation also determines the mandatory installation of solar collectors and evaluates the use of other renewable energy sources while rating the energy performance of the building.

[19] Regulation on the Thermal Behaviour Characteristics of Buildings, approved by Decree-Law no. 80/2006 of the 4 April.
[20] Regulation on Energy Climatisation Systems in Buildings – RSECE, approved by Decree-Law no. 79/2006 of the 4 April.

The RSECE sets out a series of requirements applicable to services and residential buildings equipped with HVAC systems, which, in addition to defining the quality of the envelope and restricting energy consumption, also regulate the efficiency and maintenance of HVAC systems in buildings and determine that mandatory audits be periodically made to services buildings. This regulation also covers the quality of indoor air, including requirements determining the renewal air rates in indoor areas and the maximum concentration of the main pollutants.

The enforcement of these regulations is controlled at different points in time, throughout the lifetime of a building, and such checks are made by experts duly qualified for the purpose. In practice these agents, together with ADENE, make sure that the SCE stays operational.

The most visible face of this work is the Energy and Indoor Air Quality Certificate issued by na expert for every building or part of it, which rates them as a function of their performance on a pre-defined scale of nine classes (A+ to G).

Each certificate is issued by the expert by way of a supporting computer system and a central register of certified buildings has been created for this purpose.

Order no. 10250/2008, of the 8 April, established the Model for the Energy and Indoor Air Quality Certificates issued in the Framework of the SCE. Likewise Order no. 11020/2009, of the 30 April, set out the simplified rules to be adopted for the Energy Certification of Existing Buildings in the framework of the RCCTE, allowing a rapid review of buildings, or parts of buildings, for which there is not any information available to fully enforce the mandatory calculation of this regulation.

Regional Decree-Law no. 1/2008/M, of the 11 January, adapts SCE, RSECE and RCCTE to the Autonomous Region of Madeira. In turn Regional Decree-Law no. 16/2009/A, of the 13 October, adapts SCE to the Autonomous Region of the Azores.

Decree-Law no. 363/2007, of the 2 November, as re-drafted by Decree-Law no. 118-A/2010, of the 25 November, established the legal system for generating power by means of small power plants called micro-generation units, with a grid-connecting capacity of up to 5,75 kW in the general system and up to 3,68kW in the subsidised system. In order to benefit from the subsidised selling rates, the promoters of this measure must install solar thermal systems or other equivalent systems using renewable energy sources.

Decree-Law no. 34/2011, of the 8 March, established the legal system applicable to power generation by means of small power plants called micro-generation units, with a grid-connecting capacity of up to 250 kW.

4.1.4. Scheduled contribution of the building sector to the 2020 targets

By extending the measures scheduled on PNAEE for 2020, a reduction of approximately 1,335 ktoe in end-use energy consumption is anticipated.

We expect that measures described in 4.1.1 above will contribute to the fulfillment of the 2020 energy efficiency targets, as shown on Table 4.1.

Table 4.1 – Measures and Contributions to the 2020 targets (global).

MEASURE	CONTRIBUTION [ktoe]
Home and Office Renovation	322.8
System of Energy Certification of Buildings	241.3
Renewables on Spot (solar thermal)	52.7
Energy Efficiency in Government Programme	95.4
Total	**712.2**

Source: DGEG

The above measures comprise sub-measures directly targeted at the building sector. A fine-tuned analysis will enable us to conclude that this sector's potential contribution to fulfill the 2020 energy efficiency targets amounts to 496.8 ktoe, as shown on Table 4.2.

Table 4.2 – Measures and Building-Sector Contributions to target fulfilment

MEASURE	CONTRIBUTION [ktoe]
Home and Office Renovation	130.5
System of Energy Certification of Buildings	241.3
Renewables on Spot (solar thermal)	52.7
Energy Efficiency in Government Programme	72.3
Total	**496.8**

Source: DGEG

In what concerns contributions to the fulfilment of the 2020 renewable energy consumption target, we anticipate that the Renewables on Spot measure, namely the Micro-Generation Programme, will produce roughly 375 GWh, for an installed capacity of 250 MW.

4.2. In the field of education and vocational training

4.2.1. The National Strategy and Policy for Energy and green jobs

The National Strategy for Energy (ENE 2020) includes a set of measures aimed at re-launching the economy and promoting employment, investing in technological research & development and improving our energy efficiency.

ENE 2020 will hopefully help us obtain, among others, the following results in terms of national employment:

- Consolidate the cluster associated with renewable energies in Portugal, so as to ensure by 2020 a Gross Value Added (GVA) of 3,800 million € and the **creation of more than 100 thousand jobs** (in addition to the sector's already existing 35 thousand).
- Continue to develop the industrial cluster associated with energy efficiency promotion, so as to ensure the **creation of 21 thousand jobs per annum, while simultaneously generating** an investment of 13 million € up to 2020 and additional exports worth 400 million €.

Renewable energies is therefore a sector with a high potential growth, which absolutely requires being followed up by a training strategy aimed at meeting the qualification requirements of this sector. On the other hand this is as sector considered as potentially capable of generating green jobs.

Generally speaking green jobs are «jobs capable of gradually reducing environmental and social impacts from different economic activities, incorporating a wide variety of training backgrounds and types of occupation and covering both rural and urban economies. Activities associated with a green job may reflect "*different shades" of green and so each different job has a different contribution to the sustainability objectives and targets. Thus the wide span of this notion stresses that not all jobs are green in the same fashion or to the same degree – in other words, not all of them contribute to sustainability alike, nor do they all ensure fair and dignifying working conditions* »[21].

In addition to the RES and energy efficiency sector, other sectors like building, agriculture and sustainable transports are also frequently pointed at as potential generators of green jobs.

This growing importance of, and demand for, green jobs associated with new skills, both from the technical point of view and as regards behaviour and mindsets vis-à-vis work, adds challenges not only to the education & training system management but also to training providers, insofar as they must find strategies to develop the new skills required.

These challenges will crop up not only in traditional occupations but will also probably generate new occupational areas and, consequently, new professional profiles.

[21] CEEETA-ECO (2010), Study on green jobs in Portugal.

4.2.2. The National Qualifications System

The National Qualifications System (NQS), established in 2007 by reforming the previous system of vocational training, aimed at integrating into a single system the vocational training attached to the educational system and the vocational training associated with the labour market, with common instruments and objectives.

Increasing the low levels of qualification of the Portuguese population, a heavy legacy that keeps Portugal significantly distant from the European Union average, was the rationale behind the investment in diversified qualification opportunities for young people and adults with a view to providing double certification (awarding a school level and a professional certification), adding flexibility to the offer of training for adults and upgrading, recognising and certifying skills acquired in non-formal and informal contexts.

One key instrument of this NQS is the National Qualifications Catalogue (NQC), which aims to set up a relevant offer of initial and continuing training adjusted to the needs of companies and of the labour market, based on the existing and emerging needs of companies and activity sectors.

In order to accomplish this goal, NQC organises the NQS double certification non-higher education qualifications and incorporates NQFs that promote and support their development. Today the NQC comprises 261 qualifications, grouped by area of education and training and by level of qualifications of the National Qualifications Framework (NQF). For each qualification, the NQC provides an occupational profile, a training NQFstandard and a standard for the recognition, validation and certification of (educational and professional) competences.

In addition to qualifications in traditional areas of the Building sector, such as plumber, painter, floor and wall tiler and mason, as well as qualifications of a more technical/intermediate level, such as project supervisor, draughtsman, instrument man, or measuring surveyor, the NQC also includes qualifications in the area of renewable energy sources, namely solar thermal systems installer, solar photovoltaic systems installer, wind energy systems installer and bio-energy systems installer.

NQC comprises training standards for these qualifications so that they can be accessed by way of a set of education & training modalities, targeted either at young people who have finished basic education and seek vocational qualification – vocational training courses or apprenticeship courses, or adults who do not possess qualifications in a given vocational domain – education & training courses for adults (EFA) and certified modulartraining. These offers shall be specified in section 6 of this report.

These qualifications can be accessed, in addition to a training pathway, by way of recognition, validation and certification of skills acquired through a non formal and informal way.

These qualifications have a national scope and may be promoted by different kinds of training operators, i.e. basic and secondary schools, vocational training schools, training centres of the Institute of Employment and Vocational Training network and certified private training providers, among others.

Following the successful completion of a NQC qualification pathway, a qualifications certificate and a diploma are issued to prove that the professional holds the competences associated with the respective professional profile and granting him/her a qualification level of the National Qualifications Framework.

4.2.3. National Qualifications Framework and European Qualifications Framework

One aim of the national qualifications system, among others, was to promote consistency, transparency and comparability of qualifications at the national and international level.

To fulfil this objective Portugal set up the National Qualifications Framework (NQF), a single NQF framework used for classify all qualifications produced within the Portuguese education & training system, irrespective of level and ways of access. NQF was established by Decree-Law no. 396/2007, of the 31 December, subsequently regulated by Ordinance no. 782/2009, of the 23 July. The framework of training levels established by Council Decision no. 85/368/EEC, of the 16 July, was thus revoked. The principles of the European Qualifications Framework (EQF) governing the levels of qualification and describing national qualifications in terms of prior learning were adopted, reiterating the principle of convergence with the EQF.

It has been in force since the 1 October 2010 and its scope is national.

Table 4.3 – Structure of the National Qualifications Framework (NQF)

QUALIFICATION LEVELS	QUALIFICATIONS
Level 1	2nd cycle of basic education
Level 2	3rd cycle of basic education, obtained in basic education or or by way of double certification pathways
Level 3	Secondary education with a view to pursuing higher level studies
Level 4	Secondary education obtained by way of double certification pathways, or secondary education with a view to pursuing higher level studies plus professional placement - minimum six months (minimum six months)
Level 5	Post-secondary non-higher level qualification, with credits for higher education studies
Level 6	*Licenciatura* degree
Level 7	Master degree
Level 8	Doctorate degree

Source: Ordinance no. 782/2009, of the 23 July

Each NQF qualification level is specified by way of a set of learning indicators , namely knowledge, skills and attitudes, according to Table 4.4.

In fact the EQF, in addition to being a device for the translation/comparability of qualifications produced by different systems, has become something of a tool that has backed up reform processes in many national systems and contributed to the creation of national qualifications frameworks. The Portuguese case was no exception; the EQF principles were adopted to create the national NQF, as regards both its 8-level structure and the description of prior learning, adequate to the Portuguese context and capable of encompassing all national qualifications.

The benchmarking process of NQF versus EQF determined a direct relationship between the national qualification levels and the EQF qualification levels.

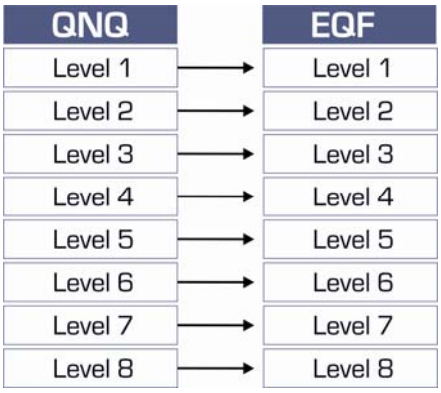


Figure 4.1 – Relationship between the national qualification levels (NQF) and the qualification levels of the European Qualifications Framework (EQF).

Table 4.4 – Descriptors of qualification levels in the National Qualifications Framework.

LEVEL		KNOWLEDGE	SKILLS	Attitudes
Non-university level	**1**	General basic knowledge	Basic skills required to perform simple tasks	Work or study under direct supervision in a structured context.
	2	Basic fact knowledge in a given area of work or study	Basic cognitive and practical skills required to apply information fitting the performance of tasks and the resolution of current problems by means of simple rules and instruments.	Work or study under supervision, with some degree of autonomy.
	3	Knowledge of facts, principles, processes and general notions in a givern area of study or work	Range of cognitive and practical skills required to perform tasks and solve problems by selecting and applying methods, instruments, materials and basic information.	Take responsibility for performing tasks in a given area of study or work. Adapt one's behaviour to circumstances in order to solve problems.
	4	Factual and theoretical knowledge in broad contexts of a given area of study or work.	Range of cognitive and practical skills required to design solutions for specific problems in a given area of study or work.	Manage one's own activity in the framework of guidelines established for study or work contexts that are generally predictable, but susceptible to change. Supervise third-party routine activities, taking some responsibility in matters of activity evaluation and improvement in contexts of study or work.
Non-university, post-secondary level	**5**	Ownership of broad, specialised, factual and theoretical knowledge in a given area of study or work and awareness that such knowledge has limitations.	Wide range of cognitive and practical skills required to design creative solutions for abstract problems.	Be able to manage and supervise in contexts of study or work susceptible to unpredictable change. Be able to review and develop one's performance and that of third parties.
University level	**6**	In-depth knowledge of a given area of study or work requiring a critical understanding of theories and principles.	Advanced skills evidencing the mastership and innovation required to solve complex unpredictable problems in a specialised area of study or work.	Manage complex activities or technical/professional projects, taking responsibility for decision-making in unpredictable contexts of study or work. Take responsibility in matters of individual and collective occupational development.
	7	Highly-specialised knowledge, some of which in a given area of study or work, which sustain one's ability to produce original thinking and/or research. Critical awareness as to issues pertaining to knowledge in a given area and interconnections among different areas.	Specialised skills for solving problems in matters of research and/or innovation, developing new knowledge and procedures and integrating knowledge from different areas.	Manage and transform complex unpredictable contexts of study or work that require new strategic approaches. Take responsibility in a way that contributes to improve knowledge and professional practice and/or review the strategic performance of teams.
	8	Highly advanced knowledge at the forefront of a given area of study or work and at the interface among areas.	More advanced and specialised skills and techniques, including synthesis and evaluation capabilities, required to solve critical problems in the area of research or innovation and re-definition of existing knowledge or professional practices.	Develop a high level of authority, innovation, autonomy, scientific or professional integrity and become strongly committed to develop new ideas or new processes at the forefront of study or work contexts, including in matters of research.

Source: Ordinance no. 782/2009, of the 23 July

5. Statistics on building and energy sectors

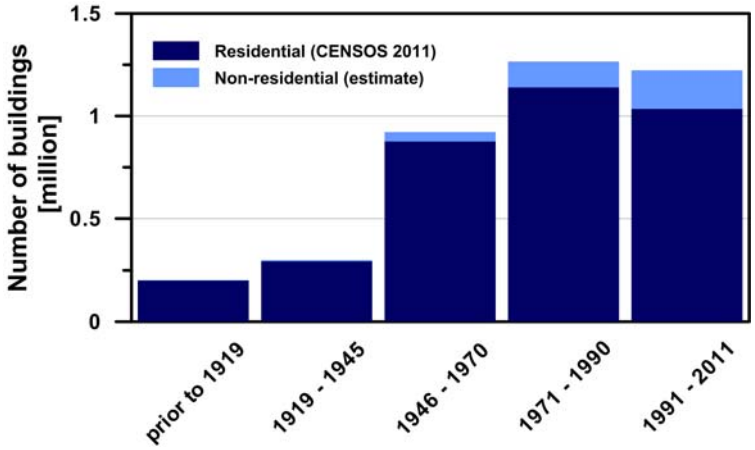
5.1. Statistics on building sector

5.1.1. Building stock

In Portugal, according to a study made by the *Buildings Performance Institute Europe*[22] (BPIE), the built-up area amounts to approximately 400 million m^2. Residential buildings represent roughly 75 percent, a value close to the European average.

Portuguese 2011 Census (CENSOS 2011) listed more than 3.5 million buildings totally or partially allocated to housing[23]. The ratio of single-dwelling buildings to the remainder (multi-family) is 87%. This however does not actually represent the share of single-family homes, insofar as there may be buildings with only one dwelling, in which the other households have been allocated to different activities, namely economic ones. The residential sector is certainly the largest segment, in terms of both number of buildings and built-up area, although no nationwide statistics are available for the non-residential building sector. Therefore we counted the total number of buildings constructed between 1999 and 2010 which were not targeted at housing purposes[24], representing an accumulated total of 73,887 and 15.4 percent of all buildings constructed in that decade (479,431).

Distribution of the residential stock, according to the last CENSOS, among different periods in the last 100 years is shown in Figure 5.1. It should be noted that 1 million (1.034 million) buildings for residential purposes were constructed in the last two decades. We can therefore estimate that approximately 180,000 non-residential buildings were constructed over the same period. A possible estimate for the total universe of this type of buildings is 300 - 400 thousand, assuming that the percentage of non-residential buildings has been growing in the last decades.



Source: CENSOS 2011 and estimate based on Statistics on Completed Works, INE (2011).

Figure 5.1 – Buildings by time of construction.

Table 5.1 shows a breakdown of non-residential buildings by category, indicating the number of building licensed in 2009 and 2010.

[22] BPIE (2011), Europe's buildings under the microscope, a country-by-country review of the energy performance of buildings.

[23] For census purposes only buildings with at least one dwelling were considered and buildings totally allocated for uses other than housing were not taken into account, thus excluding from the census buildings exclusively assigned to economic activities. Nevertheless all buildings constituting collective lodging (hotels, inns and co-habitation lodgings – i.e. homes for the elderly, accommodation centres for children, hospitals, schools with boarding, prisons, etc.) were considered.

[24] INE (2011), Statistics on Completed Works.

Table 5.1 – New non-residential buildings licensed in 2009 and 2010.

	NO. OF BUILDINGS		AREA [thousand m^{2A}]	
Agriculture and Fisheries	1,164	13%	414	6%
Industry	864	9%	1.683	24%
Tourism	418	5%	663	10%
Other services	1,681	18%	2,391	34%
Other uses	5,098	55%	1,800	26%
NON-RESIDENTIAL TOTAL	9,225		6,951	
RESIDENTIAL TOTAL	30,856		9,504	

Source: Building and housing statistics, INE (2010).

We can use as benchmark the European average data included in the BPIE study[20] , in which commercial buildings (retail and modern distribution) represent the largest share (28 percent), followed by office buildings, with nearly 23 percent, and education establishments with 17 percent. Reference should also be made to two other categories, hotels/restaurants (7 percent) and Others (warehouses, garages, farming buildings) with a 11 percent share.

- As explained by AECOPS[25], demand in the Building sector is rather low. The following aspects need to be stressed:
- In 2011 less than 17 thousand dwellings were licensed, the lowest figure since 1995. It should also be noted that 2012 is the 12nd consecutive year in which the number of applications for permits has dropped.

On the other hand, up to February the public contracts market indicators showed significant reductions in terms of invitations to tender (-64%) and contract awards (-37%), values in line with those of 2011 (-29% of invitations to tender).

As a result of such reductions, the business and employment fabrics have been negatively impacted, as evidenced from the figures below:

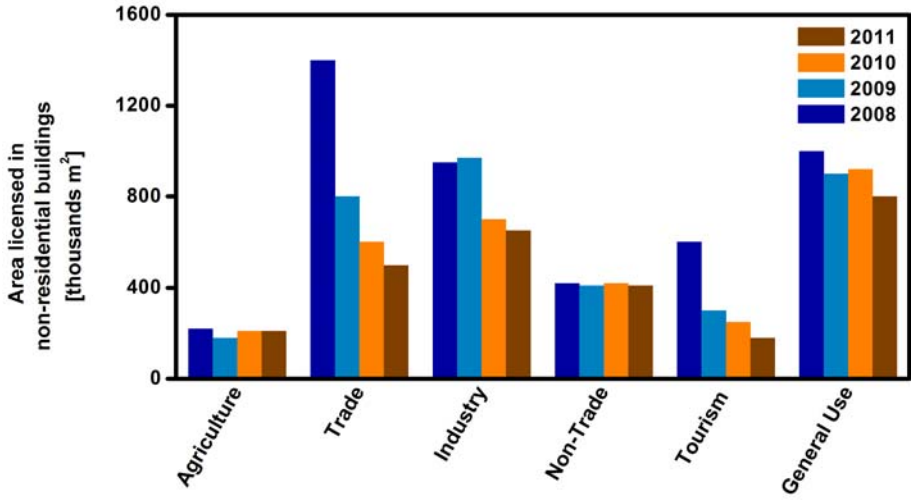
- Reduction of the number of licensed companies. Up to early March, those with construction permit had dropped by 8.5 percent and those with registration certificate by 3.7%.
- Increased number of bankruptcies in building companies, i.e. more 17.3 percent in 2011 than in the previous year, corresponding to 1,138 companies (more than 3 per day).
- In 2011 the Building sector reached the lowest level of employment, which did not exceed 418 thousand workers and was the lowest of the last 14 years. As reported in the 2011 INE Employment Survey, the average number of employed workers was 440.3 thousand, i.e. 9.1 percent of total employment (9.7 in 2010).
- The level of unemployment and of unemployed workers from the Building sector registered at employment centres has grown significantly (more than 90 thousand up to late January), a number corresponding to 15.3 percent of total unemployment. Another important datum is that in January the compared growth versus the same period of the previous year was 22 percent, in sharp contrast with the figures of total unemployment (14 percent).

According to FEPICOP[26], as regards the construction of new buildings, 997 new dwellings were licensed in December 2011 (-42% versus the same period of the previous year). Globally speaking the number of licensed dwellings was 16,737 (-32,% versus 2010).

In 2011 the reduction for residential buildings rose to 1.627 m^2 versus the previous year. As for services buildings, the area licensed in 2011 was approximately 312,108 m^2 lower than the 3,083,267 m^2 registered in 2010. Analysis by type of use shows that the largest reductions occurred in tourism (-25 percent), followed by trade (-19.6 percent) and general use (-12.7 percent) (Figure 5.2).

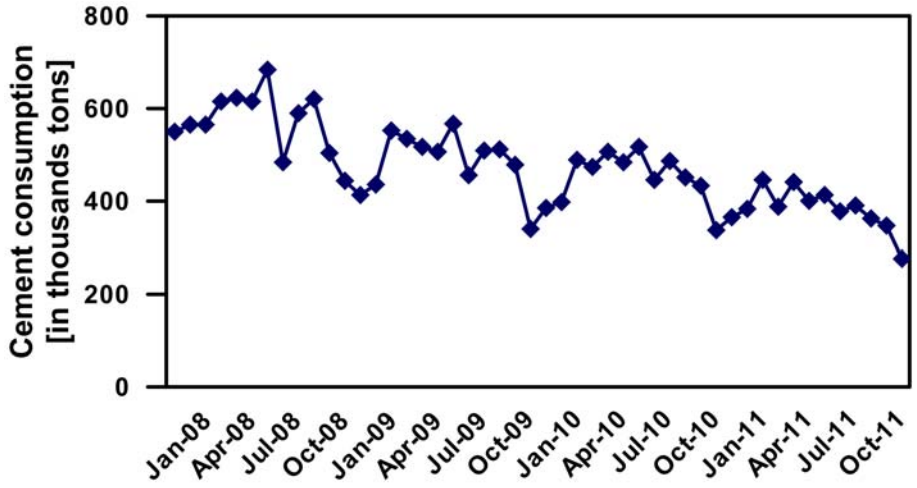
[25] AECOPS (2012), Regional Review.
[26] FEPICOP (2012), Análise da conjuntura, n.º 59.

In December cement consumption dropped by 18.4 percent versus the same period of 2010, confirming what has been registered since 2001 and corresponding to an accumulated reduction of 55.6 percent.



Extracted from FEPICOP Juncture Analysis[24], Source: INE.

Figure 5.2 – Licensed area in non-residential buildings.



Extracted from FEPICOP Juncture Analysis[24], Source: ATIC, FEPICOP.

Figure 5.3 – Key players in the Building market.

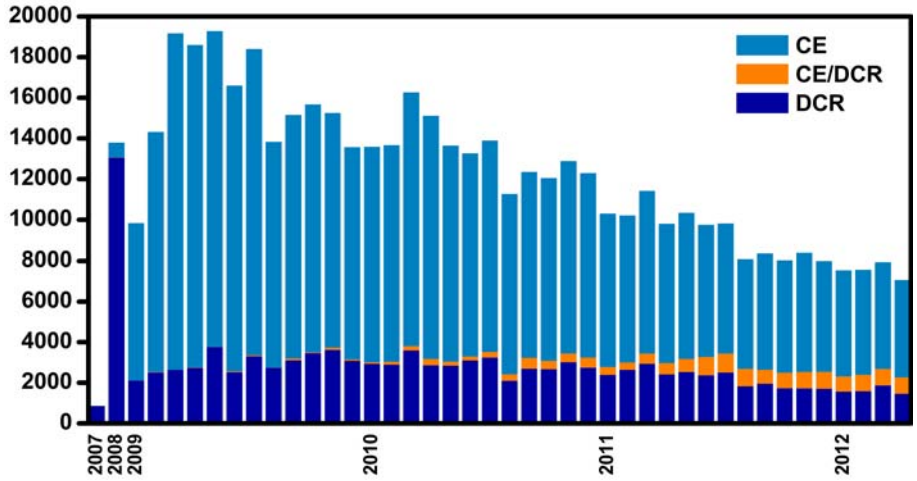
According to the data included in the INE document[27], 2011 indicators concerning the licensing of works were the lowest ever. In fact 5.7 thousand buildings were licensed, representing an annual reduction of 10.7 percent (2011, Quarter 4). In terms of completed buildings, the annual average variation was 3.7 percent and 7.6 thousand buildings were completed. Using as benchmark Quarter 1 of 2001, the number of residential buildings completed was the lowest ever. Reference should bem ade to the 6-percent reduction of licensed buildings and, in contrast, estimates that indicate a 1.9-percent growth of completed buildings.

[27] INE (2012), Callout: Information to the Media, dated 15 March.

5.1.2. Buildings with high energy performance

The information immediately provide regards a monthly-updated summary on the National System for the Energy and Indoor Air Quality Certification of Buildings (SCE), covering the registration of Energy Certificates (CE) and Statements of Conformity (DCR), which apply respectively to constructed buildings and buildings at the design phase.

Today there are approximately 500 thousand buildings certified under the Energy Certification System (SCE), of which 100 thousand are at the design phase and the remaining 400 thousand[28] are existing and recently-built property for which a DCR has already been issued. Buildings for residential purposes still lead the way, with 90 percent of the certificates issued under the SCE. The evolution of registrations, since the SCE entered in force, is found in Figure 5.4.



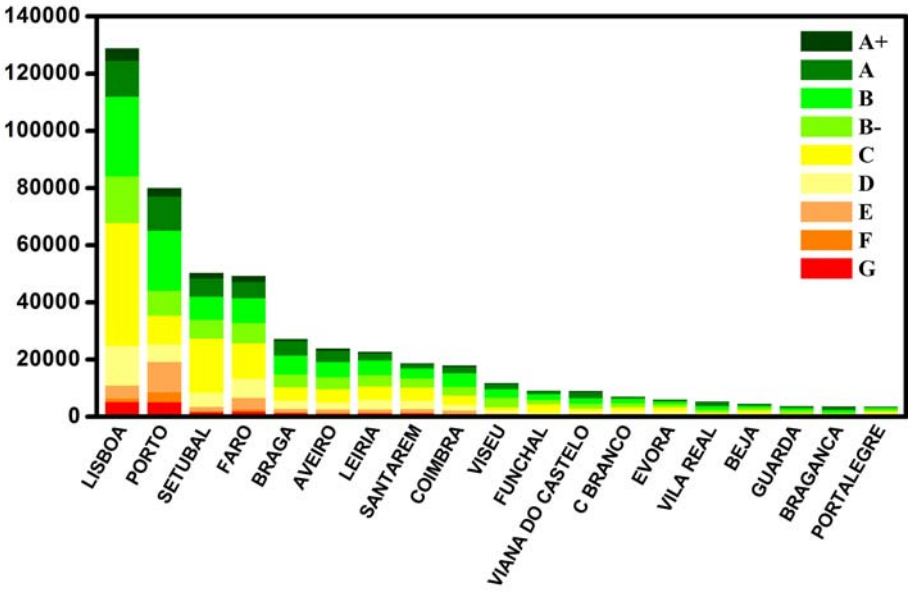
Source: ADENE.

Figure 5.4 – Number of Energy Certificates (CE) and Statements of Conformity (DCR) issued.

In 2011-2012 an average 9.1 thousand certificates were issued per month. The issue of certificates for newly constructed buildings grew and in that one-year period these represented 8 percent of registrations.

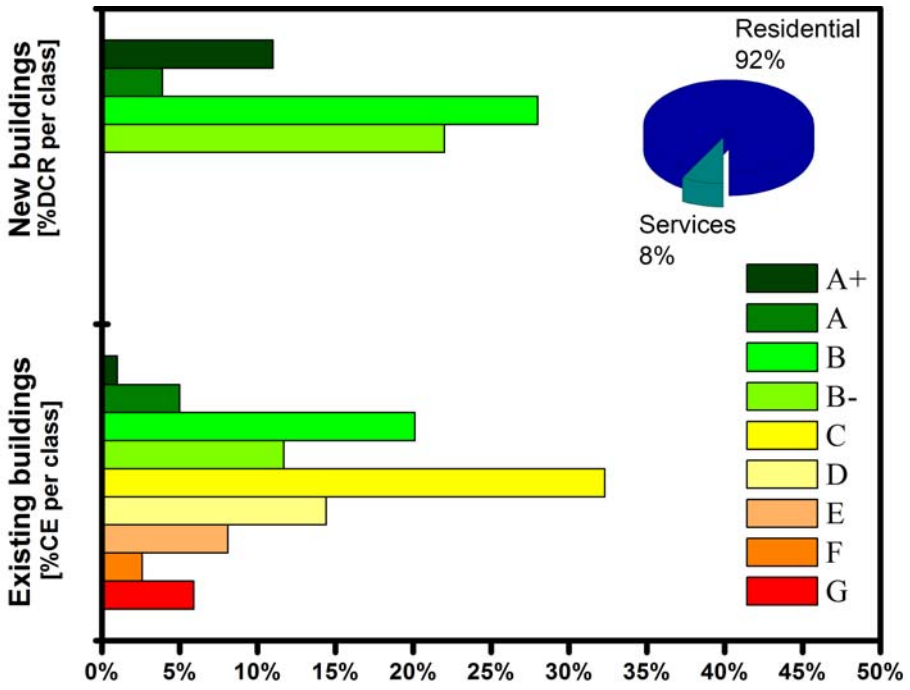
Total number of SCE registrations by energy efficiency class and by region (Figure 5.5) shows that Lisbon, Porto, Setúbal and Faro are the regions with the highest number of certified buildings. These regions comprise 65 percent of the certified buildings universe, particularly n the “C” and “B” energy classes, mirroring the class distribution observed at the national level.

28 The base for SCE certification is the autonomous building part, in this case identified per building. In residential buildings, such part corresponds to the each dwelling/lodging unit and it is not therefore possible to quantify which share of the building stock has already been certified.



Source: ADENE.

Figure 5.5 – Number of Energy Certificates/Statements of Conformity issued by region and energy class.



Source: ADENE.

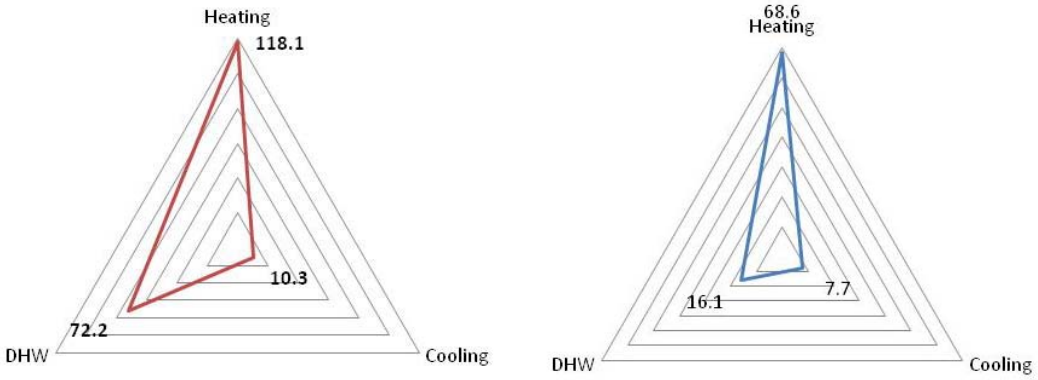
Figure 5.6 – Energy class of new buildings and existing buildings.

Energy Certificates (CE) issued for existing buildings of the residential and services categories, with class A and A+, have the following distribution; 18,675 and 392, representing approximately 5% and 1% of the full range of energy classes within the two categories. As to the percent distribution per type of building, 90 and 10 percent correspond roughly 460 and 40 thousand certified buildings, respectively.

Existing buildings have a low level of energy efficiency, when compared to new ones. In addition to traditional renovation, existing buildings must have a high potential for improving their energy efficiency once the energy efficiency improvement measures have been adopted.

Requirements imposed by the thermal regulation of buildings currently in force led to considerable improvement of energy efficiency in buildings, although there is still room for further improvement measures.

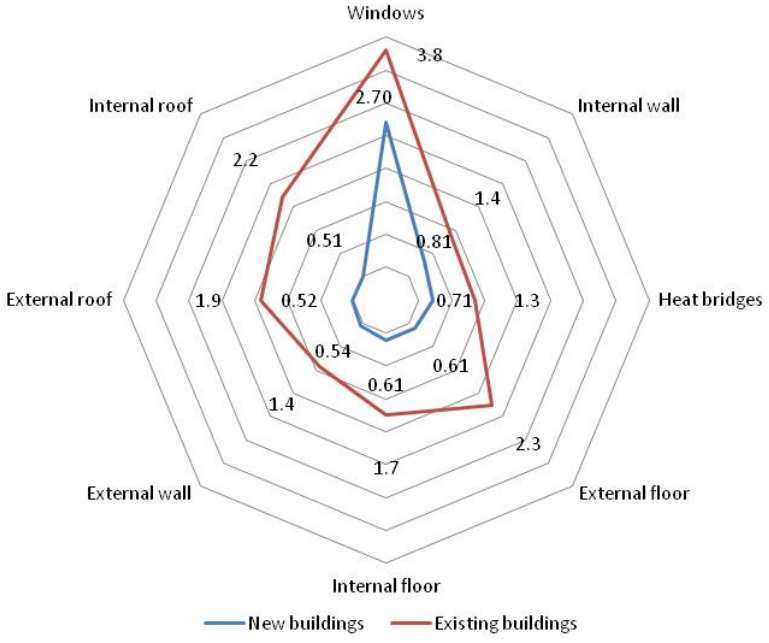
The Energy Certification System for Buildings (SCE) is a very useful tool for evaluating a building's energy efficiency. Figure 5.7 makes it possible to evaluate the evolution of energy performance indicators, namely the nominal energy needs in the residential sector for existing and new buildings, built respectively before and after the entry into force of the regulation on buildings in 2006.



Source: ADENE.

Figure 5.7 – Energy needs in nominal conditions, expressed in kWh/(m^2.year), in existing buildings (left) and new buildings (right)

Figure 5.8 makes it possible to evaluate the energy performance of envelope components of buildings in the residential sector (existing and new buildings, respectively built before and after the regulation on buildings entered into force in 2006).



Source: ADENE.

Figure 5.8 – Evolution of the heat transfer factor, expressed in W/(m^2.U), of envelope components in residential buildings.

Information about the existence of thermal insulation in building envelopes, available in a study made by DGEG based on a household survey[29], is provided in Table 5.1 below.

Table 5.1 – Number of dwellings with thermal insulation in the outer envelope.

LOCATION OF INSULATION	NO. DWELLINGS	%
Outdoor walls with insulation	828 494	21,1
Roof of dwelling with insulation (1)	434 099	17,1

(1) Only upper floor flats and single-family houses were considered.

Source: DGEG

The survey also includes a characterisation of glazed surfaces in residential buildings, shown in Table 5.2.

Table 5.2 Types of glazing panes according to façade orientation

TYPE OF GLAZING PANE	NO. DWELLINGS		AVERAGE GLAZED AREA
	[No.]	[%]	[m^2/dwelling]
SOUTH-ORIENTED FAÇADES			
Plain glazing	1 982 799	75.4	4.5
Double glazing, frames allowing heat bridge	495 894	18.9	6.3
Double glazing, frames eliminating heat bridge	184 583	7.0	7.2
EAST-ORIENTED FAÇADES			
Plain glazing	1 968 296	72.3	4.5
Double glazing, frames allowing heat bridge	620 719	22.8	6.5
Double glazing, frames eliminating heat bridge	164 313	6.0	5.5
WEST-ORIENTED FAÇADES			
Plain glazing	1 915 448	72.3	4.3
Double glazing, frames allowing heat bridge	604 934	22.8	6.0
Double glazing, frames eliminating heat bridge	160 542	6.1	5.3

Source: DGEG

5.2. Building Sector Operators

According the InCI Report[30] of September 2011, the legislation currently in force (Decree-Law no. 12/2004, Decree-Law no. 18/2008 and Decree-Law no.69/2011) that regulates the building sector activity states that all agents must hold a license (construction permit or registration) issued by InCI itself.

Such license, as a function of the level associated with it, establishes the maximum value of works to be done, based on the categories and sub-categories defined by Ordinance no. 19/2004, of the 10 January.

At the end of 2011, the Building sector had 23,555 companies operating with a Construction Permit and 37,693 with a Registration Certificate (Table 5.3).

[29] DGEG (2010), Survey on Energy Use in the Household Sector.

[30] InCi (2011), O Sector da Construção em Portugal em 2010.

Table 5.3 – Operators allowed to develop building activities.

	WITH REGISTRATION CERTIFICATE	WITH CONSTRUCTION PERMIT	TOTAL NUMBER OF OPERATORS
2009	39728	24243	63971
2010	38931	23859	62790
2011	37693	23555	61248

Source: InCI

According to the same Report, the number of awarded licenses remains stable, in spite of a trend of slight decrease. It also states that such decrease, of only 1.6 percent, does not mean that the sector is not being affected by the crisis.

Reference is also made to the fact that the agents of certain classes are undergoing significant changes, materialised in the form of increases of classes 2 (2.12 percent) and 5 (1.09 percent).

On the contrary awarded licenses dropped by 2.1 percent, having decreased from 39,780 to 38,931 in 2009. Since these have a 5-year validity, the impact of reduced activity ends up diluting itself with time.

Results from the analysis of the 20-largest operators indicators show, as upside, that the respective economic and financial performance is more solid in the framework of the sector operators. Table 5.4 makes it possible to view the number of companies in terms of turnover class.

Table 5.4 – Number of companies per turnover class.

TOTAL COMPANIES	NO.
Class 1	179
Class 2	51
Class 3	34
Class 4	23
Class 5	8
Class 6	2
TOTAL	297

Source: InCI, I.P.

5.3. Employment Statistics in the Building Sector

5.3.1. Context

Our purpose in this section is to characterise employment in those activities of the building and energy sector whose professionals can potentially take action in occupational activities that may contribute to improve energy efficiency, as this is the objective of this work. We therefore chose not to look into the sector as a whole, but only those activities and occupations with a more direct contribution to fulfil the said objective.

Statistical data were collected from the Strategy and Planning Office of the Ministry of the Economy and Employment and refer to the information available on Employed Person through the Permanent Staff inquiry. The most recent official data available, with breakdown per occupation, correspond to 2007, 2008 and 2009 and use Portuguese Classification of Economic Sectors (CAE Rev3), as well as the National Classification of Occupations (CNP 94). It should be noted that CNP 94 ceased to be used in data collection for producing national statistics as from 2011 and was replaced by the Portuguese Occupational Classification (CPP 2010).

Bearing this mind and in order to collect statistical data exclusively from official sources, we selected only a few economic activities from the Building sector, as well as a few occupations listed on CNP 94 which, in our view, best suit this work's purpose. Table 5.5 shows the set of building sector occupations and the set of economic activities selected for this statistical analysis.

Special reference should be made to the fact that renewable energies' professionals are explicitly absent from the following analysis. Indeed National Classifications of Occupations (CNP 94), used for collecting data pertaining to the period under review, did not include any occupation in this field and so

professionals developing activities in these domains were classified in other occupations, namely of the electricity sector. We cannot therefore statistically identify, based on Staff data (the only source enabling a 5-digit statistical analysis by occupation), the number of employed persons developing their activity specifically in these occupations, although incorporated in other occupations.

Table 5.5 – Occupations covered by the employment statistical analysis, by economic activity of the Building sector considered.

BUILDING (F SECTION)	PORTUGUESE DICTIONARY OF OCCUPATIONAL TITLES (1994 VERSION – LARGE GROUPS 3 AND 7)
41200-Construction of residential and non-residential buildings.	3.1.1.2.05 – Building Engineering Technician 3.1.1.2.10 – Measuring Surveyor 3.1.1.8.05 – Chief draughtsman 3.1.1.8.10 - Draughtsman 7.1.2.2.05 - Mason 7.1.2.2.10 – Refractory bricklayer 7.1.2.3.05 – Reinforcement concreter 7.1.2.3.15 – Concrete spreader operator 7.1.2.3.20 – Masonry (prefab) machine operator 7.1.2.3.25 – Masonry (prefab) assembler 7.1.2.3.30 – Pre-stressed concrete assembler 7.1.2.3.35 – Construction supervisor
43210- Electrical installation and repair (of building electrification and energy distribution in industrial facilities; telecommunications cabling; IT cabling; cable TV; fire and burglary alarms; antennas and lightning protection, lighting and signalling electrical systems. Includes electrical connection for home appliances).	3.1.1.3.05 – Electrical installation technician 3.1.1.3.15 – Maintenance man (electricity) 3.1.1.3.20 – Electrical network technician 7.2.4.1.35 – Electrician-assembler of high-voltage installations 7.2.4.1.40 – Electrician-assembler of low voltage installations 7.2.4.1.60 – Network electrician (electrical energy distribution)
43221- Plumbing installation and repair (of plumbing networks [water, gas, sewage] and their connections to general distribution networks, high-pressure networks for fire-fighting and watering, fixed sanitation equipment).	7.1.3.6.05 - Plumber 7.1.3.6.10 – Pipe fitter
43222- Air conditioning installation (installation, maintenance and repair of heating [including non-electrical solar energy collectors], ventilation, cooling or climatisation [including air conditioning] systems in buildings. Activities of maintenance of indoor air quality in buildings are also included).	3.1.1.3.10 – HVAC technician 7.2.4.1.20 – Electrical mechanic s of HVAC equipment
43290 – Other construction installation (installation, repair and maintenance of fences, iron fences and similar equipment in buildings and other venues, lifts and rolling staircases, automatic and revolving doors, cleaning and vacuum system, thermal, acoustic and vibration insulation).	7.2.4.1.15 – Electrical mechanics of lifts and similar equipment
43910 – Roofing activities (construction and repair of roofs and structures to be applied in roofs, installation of trough supports and gutters, metal or other coating for roofs).	7.1.3.1.05 – Sheet fitter-assembler (fibre-cement)
43310 – Plastering (in buildings or other works, including the fitting of coating materials associated with plastering).	7.1.3.2.20 – Floor layer 7.1.3.3.05 - Plasterer 7.1.3.4.05 - Insulator 7.1.3.4.10 – Mastic asphalter
43320 – Joinery installation (assembling of closets, wardrobes, doors, windows, shutters and execution of similar works in wood and other materials [including fire resistant]. Includes carpentry work made for the works [shuttering, blind floors, partition walls]).	7.1.2.4.05 – Clean carpenter 7.1.2.4.10 – Rough Carpenter
43330 – Floor and wall covering (carpets, tiles, glazed-tiles, marbles, linoleum, wall paper, granit, slate, cork, parquetry and other wood coatings).	7.1.3.2.10 – Floor and wall tiler 7.1.3.2.15 – Parquetry worker
43340 – Painting and glazing	7.1.4.1.05 – Building Painter 7.1.3.5 - Glazier
43390 – Other building completion and finishing	–
43992 – Other miscellaneous specialised construction activities	7.1.4.3.10 – Chimney sweep

5.3.2. Statistical analysis

Considering the assumptions and options defined in the previous section, we used the following indicators to make the statistical analysis of the set of CAE selected activities, only considering the selected occupations:

- Number of employed persons by economic activity, in 2009
- Number of employed persons in the building sector, by occupation, in 2009
- Number of employed persons in the building sector, by occupation, as a function of the 2007-2009 variation
- Number of employed persons in the building sector, by occupation, by region (NUT II), in 2009
- Number of employed persons in the building sector, by economic activity (building), by qualification level, in 2009
- Number of employed persons in the building sector, by economic activity, as a function of educational background and the 2007-2009 variation

In our first more global analysis, we found out that in 2009 of the 100,850 employed persons developing specific activities in the building sector, within the selected CAE and occupations, 68% were integrated into the 41200 economic activity – construction of residential and non-residential buildings. The others were scattered among all other economic activities, with shares varying from 0.1 percent (only 120 workers registered in CAE 43910 – roofing activities) and 5 percent in all other activities (Table 5.6).

Table 5.6 – Number and percentage of employed persons in the building sector, by economic activity, in 2009.

CAE	TOTAL	
	[NO.]	[%]
41200 - Construction of residential and non-residential buildings	68 644	68%
43210 - Electrical installation	5 440	5%
43221 - Plumbing installation	4 055	4%
43222 - Air conditioning installation	1 921	2%
43290 - Other construction installation	3 448	3%
43310 - Plastering	1 974	2%
43320 - Joinery installation	3 251	3%
43330 - Floor and wall covering	2 479	2%
43340 - Painting and glazing	3 915	4%
43390 - Other building completion and finishing	1 596	2%
43910 - Roofing activities	120	0.1%
43992 - Other miscellaneous specialized construction activities	4 007	4%
TOTAL	100 850	100%

Source: Strategy and Planning Office of the Ministry of the Economy and Employment – Permanent Staff inquiry, 2009

These workers, roughly 100 thousand, developed their activity at approximately 42 thousand companies, distributed by the different subsectors considered in this analysis, as follows (Table 5.7).

Table 5.7 – Number of companies by economic activity in the building sector in 2009 (considering Employed Persons in the selected occupations)

CAE	2007	2008	2009
41200 - Construction of residential and non-residential buildings	27,652	26,730	24,645
43210 - Electrical installation	3,899	4,035	3,996
43221 - Plumbing installation	2,208	2,239	2,153
43222 - Air conditioning installation	870	831	879
43290 - Other construction installation	1,192	1,154	1,118
43310 - Plastering	884	896	787
43320 - Joinery installation	2,550	2,420	2,225
43330 - Floor and wall covering	1,446	1,517	1,425
43340 - Painting and glazing	1,524	1,555	1,479
43390 - Other building completion and finishing	1,472	1,491	1,356
43910 - Roofing activities	99	122	110
43992 - Other miscellaneous specialized construction activities	2,095	2,080	1,849
TOTAL	45,891	45,070	42,022

Source: Strategy and Planning Office of the Ministry of the Economy and Employment – Permanent Staff inquiry, 2009

As regards the occupations of the **employed persons** registered in 2009 for the selected CAE economic activities and occupations, we find out that, out of a total 100,850 workers, 41 percent are masons (41,408 workers) and the remainder are markedly scattered among all other occupations in this sector, ranging from 0.01 percent (Masonry [prefab] machine operator) and 9 percent (Construction supervisor and Rough Carpenter) (Table 5.8).

Table 5.8 – Employed persons in the building sector, by occupation, in 2009.

OCCUPATION-CNP	TOTAL	
	[NO.]	[%]
311205 - Building Engineering Technician	2,938	3%
311210 - Measuring Surveyor	805	1%
311305 - Electrical installation technician	962	1%
311310 - Cold Storage & Climatisation Technician	747	1%
311315 - Maintenance man (electricity)	104	0.1%
311320 - Electrical network technician	29	0.03%
311805 - Chief draughtsman	290	0.3%
311810 - Draughtsman	634	1%
712205 - Mason	41,408	41%
712210 - Refractory bricklayer	519	1%
712305 - Reinforcement concreter	1,250	1%
712315 - Concrete spreader operator	35	0.03%
712320 - Masonry (prefab) machine operator	8	0.01%
712325 - Masonry (prefab) assembler	199	0.2%
712330 - Pre-stressed concrete assembler	116	0.1%
712335 - Construction supervisor	8,655	9%
712405 - Clean carpenter	5,324	5%
712410 – Rough Carpenter	9,216	9%
713105 - Sheet fitter-assembler (fibre-cement)	30	0.03%
713210 - Floor and wall tiler	1,416	1%
713215 - Parquetry worker	194	0.2%
713220 - Floor layer	1,698	2%
713305 - Plasterer	3,594	4%
713405 - Insulator	960	1%
713410 - Mastic asphalter	548	1%
713505 - Glazier	121	0.1%
713605 - Plumber	5,596	6%
713610 - Pipe fitter	405	0.4%
714105 – Building Painter	7,455	7%
724115 - Electrical mechanics of lifts and similar equipment	1,253	1%
724120 - Electrical mechanics of HVAC equipment	603	1%
724135 - Electrician-assembler of high-voltage installations	206	0.2%
724140 - Electrician-assembler of low voltage installations	2,219	2%
724160 - Network electrician (electrical energy distribution)	1,313	1%
TOTAL	100,850	100%

Source: Strategy and Planning Office of the Ministry of the Economy and Employment – Permanent Staff inquiry, 2009

It should be noted that the representation of several occupations is lower than 1 percent – for example, with only 0.01 percent Masonry (prefab) Machine Operators and with 0.03 percent Electrical Network Technicians (29 workers), Fibre-cement Sheet Fitter-assemblers (30 workers) and Concrete spreader operators (35 workers). We found other occupations more or less in the same situation, namely Electricity Maintenance Men (104 workers), Pre-stressed Concrete Assemblers (116 workers), Glaziers (121 workers), Parquetry workers (194 workers), Masonry (prefab) Assemblers (199 workers), Electrician-Assemblers of High-Voltage Installations (206 workers) and Glaziers (405 workers).

We found out, as we examined data regarding employed persons developing specific activities in the building sector, for the selected CAE and occupations in the 2007-2009 period, that the number of professionals dropped by 17 percent over this period. This decrease was more marked as regards Pre-stressed Concrete Assemblers (41 percent reduction), followed by Rough Carpenters (49 percent) and Electrical network technicians (33 percent) (Figure 5.9).

On the other hand the number of Electrical Installation Technicians stabilised (a reduction of only -0.3 percent) and the number of professionals employed as Refractory Bricklayers, Floor and Wall Tilers and Electrical Fitters of Lifts and Similar Equipment grew by 45, 43 and 28 percent, respectively.

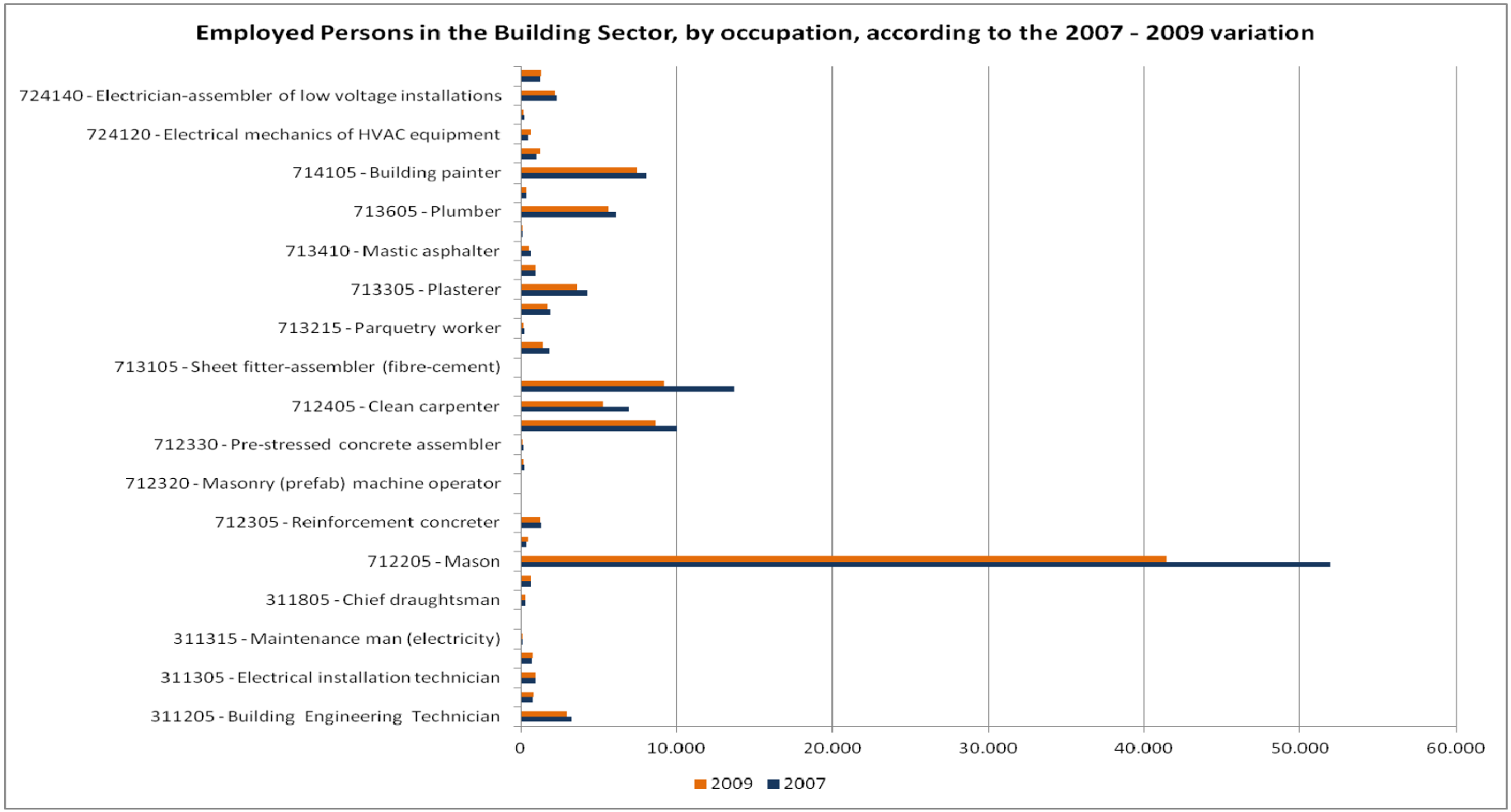


Figure 5.9 – Employed persons in the building sector, by occupation, according to the 2007-2009 variation.

We found out that, in terms of **geographical distribution**, workers from Portugal's Mainland are highly prevalent (94 percent) among the 100,850 Employed Persons who developed specific activities in the Building sector in 2009, in the selected CAE activities and occupations (Figure 5.10).

As regards the distribution of these workers among different occupations under analysis, by region, we found out that 38 percent work in Northern Portugal, followed by Central Portugal and Lisbon, with 24 and 20 percent of employed persons, respectively. In the remaining regions (Alentejo and Algarve), in addition to a significantly lower number of employed persons in these activities, some occupations are absent, i.e. Maintenance Men (Electricity), Refractory Bricklayers, Masonry (Prefab) Machine Operator and Glazier in the Algarve; Refractory Bricklayers, Concrete Spreader Operator, Masonry (Prefab) Machine Operator, Reinforcement Concreter, Fibre-cement Sheet Fitter-Assembler and Glazier, in the Alentejo Region.

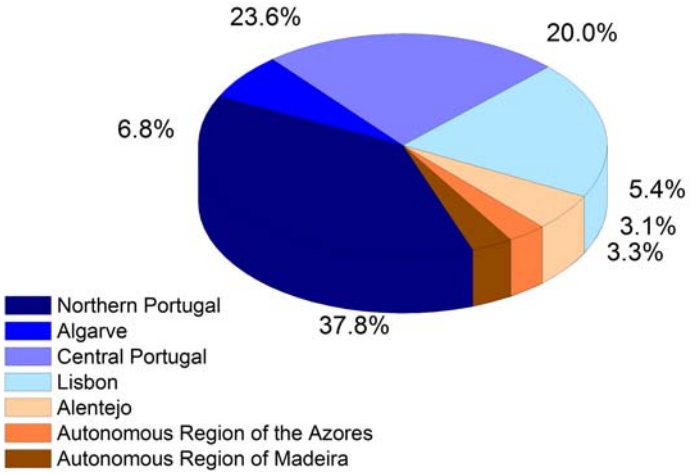


Figure 5.10 – Employed persons in the Building sector, by region (NUT II), in 2009

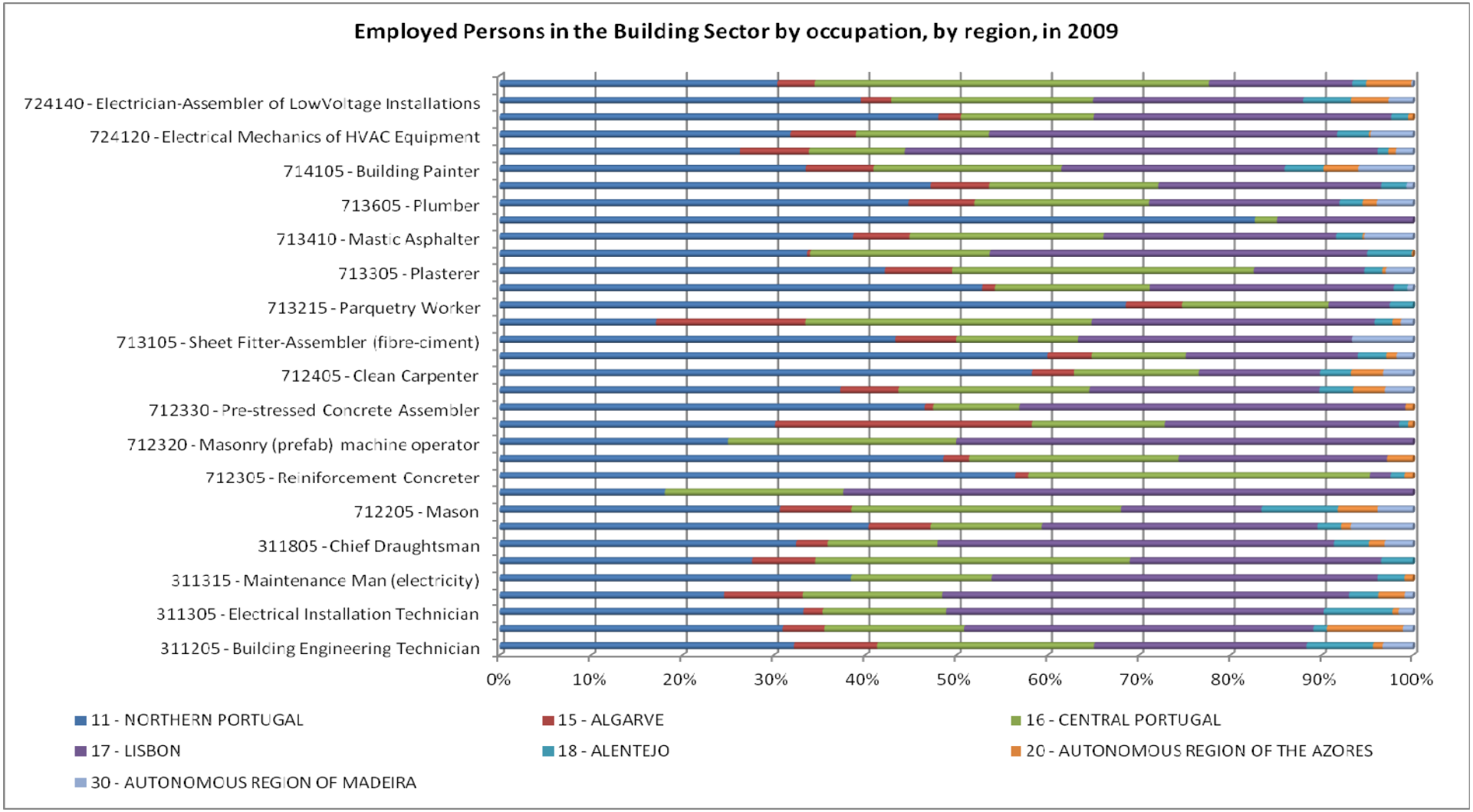


Figure 5.11 – Employed Persons in the Building Sector by occupation, by region, in 2009

We also learned from the data concerning the geographical distribution of Employed Persons that, in certain occupations, Northern Portugal accounts for more than 50 percent of self-employed persons in the country working for companies operating in the economic activities selected for this study, namely Reinforcement Concreter, Clean Carpenter and Rough Carpenter, Parquetry Worker, Floor and Wall Tiler and Glazier. In turn the Lisbon region accounts for more than 50 percent of workers with the following occupations, i.e. Refractory Bricklayer, Masonry (Prefab) Machine Operator and Electrical Mechanics of Lifts and Similar Equipment, considering all the selected economic activities.

As regards the analysis by qualification level, a classification traditionally used as framework for the type of functions performed in the context of labour market bargaining system, we found out that, out of the 100,850 workers identified for the selected CAE economic activities and occupations, 74 percent are qualified professionals (performing execution functions in a given occupation).

There are few employed persons in the remaining qualification levels. Eight percent areforemen supervisors, masters and team leaders and only 0.2 percent are senior managers; our analysis by CAE subsector showed this same distribution (Figure 5.11 and Figure 5.12).

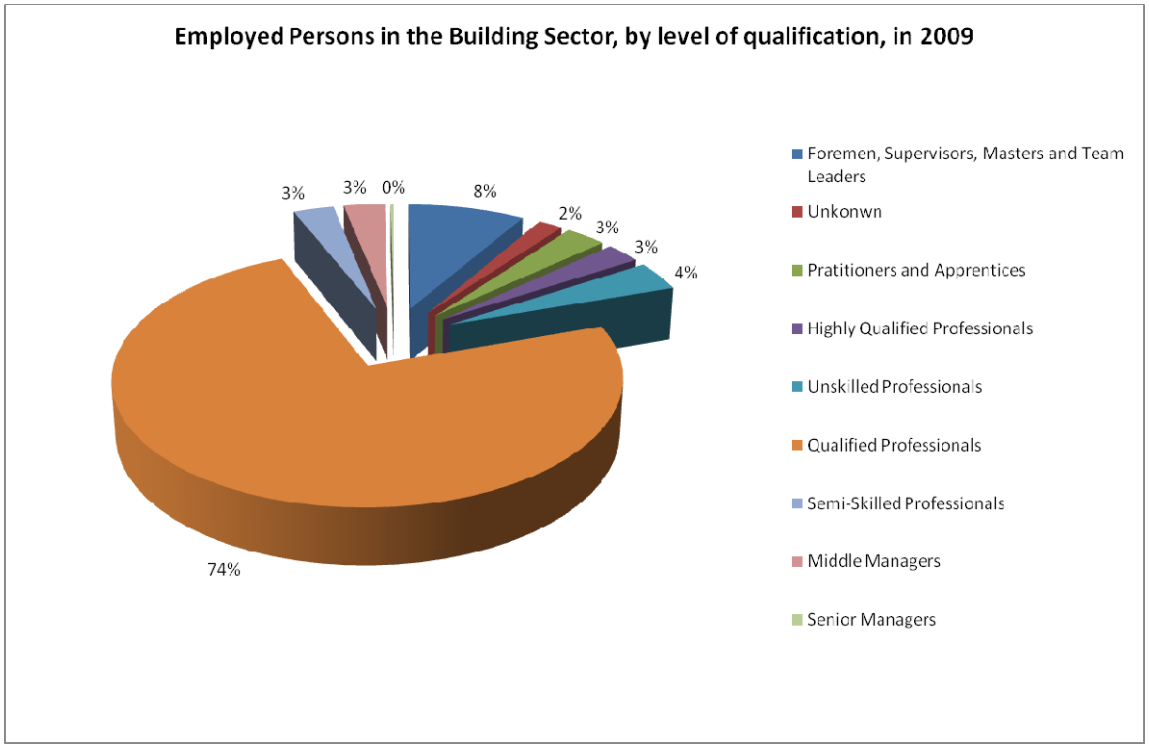


Figure 5.12 – Employed Persons in the Building sector, by level of qualification, in 2009.

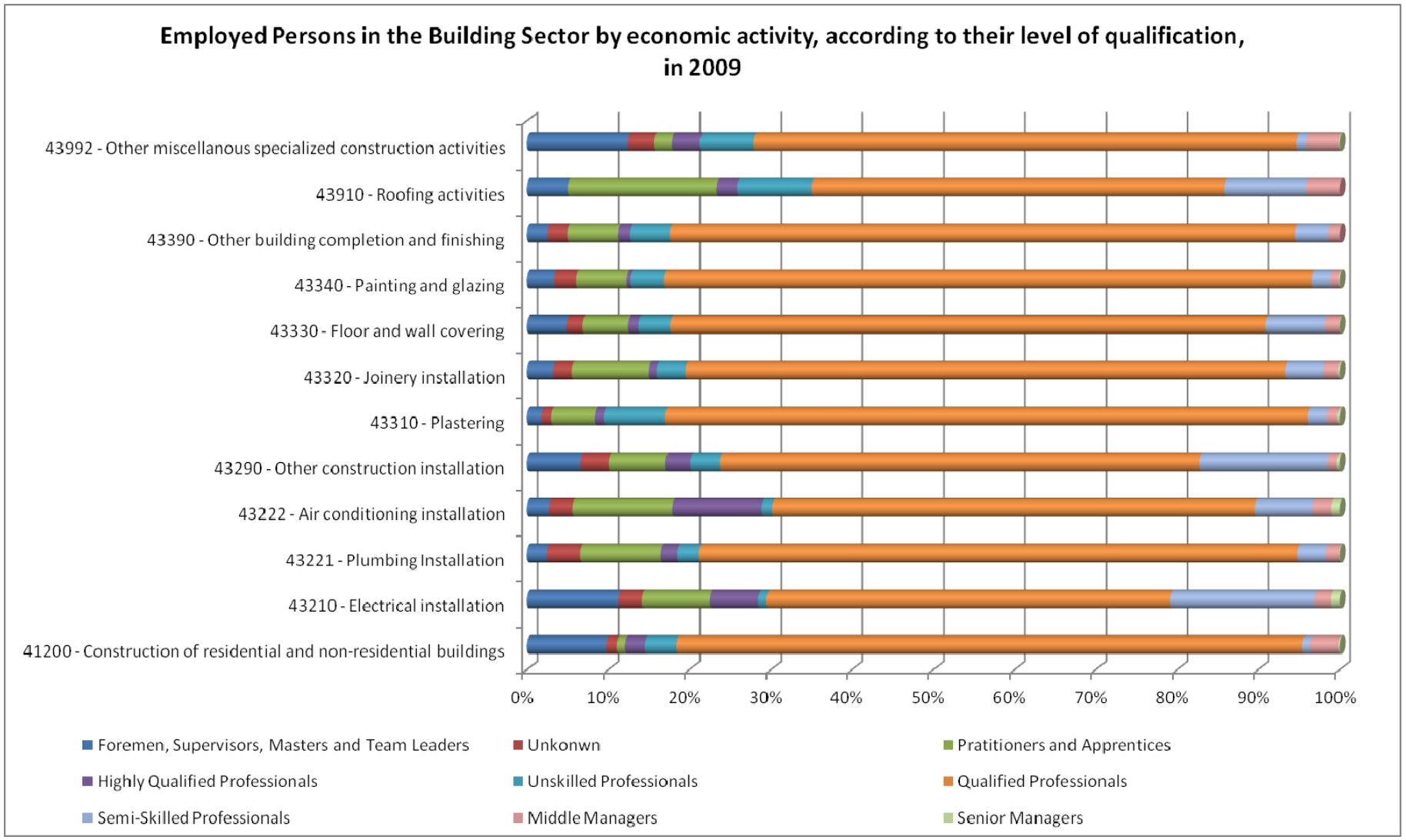


Figure 5.13 – Employed Persons in the Building Sector by economic activity, according to their level of qualification, in 2009

We also looked into the **educational background** of the 100,850 Employed Persons registered in 2009, developing specific activities in the Building sector, in the selected CAE economic activities and occupations. Our data showed that 86 percent of them have finished basic education and 6 percent secondary education, the remaining educational levels being irrelevant for comparison purposes (Figure 5.14). Analysis by CAE subsector showed the same distribution (Figure 5.15).

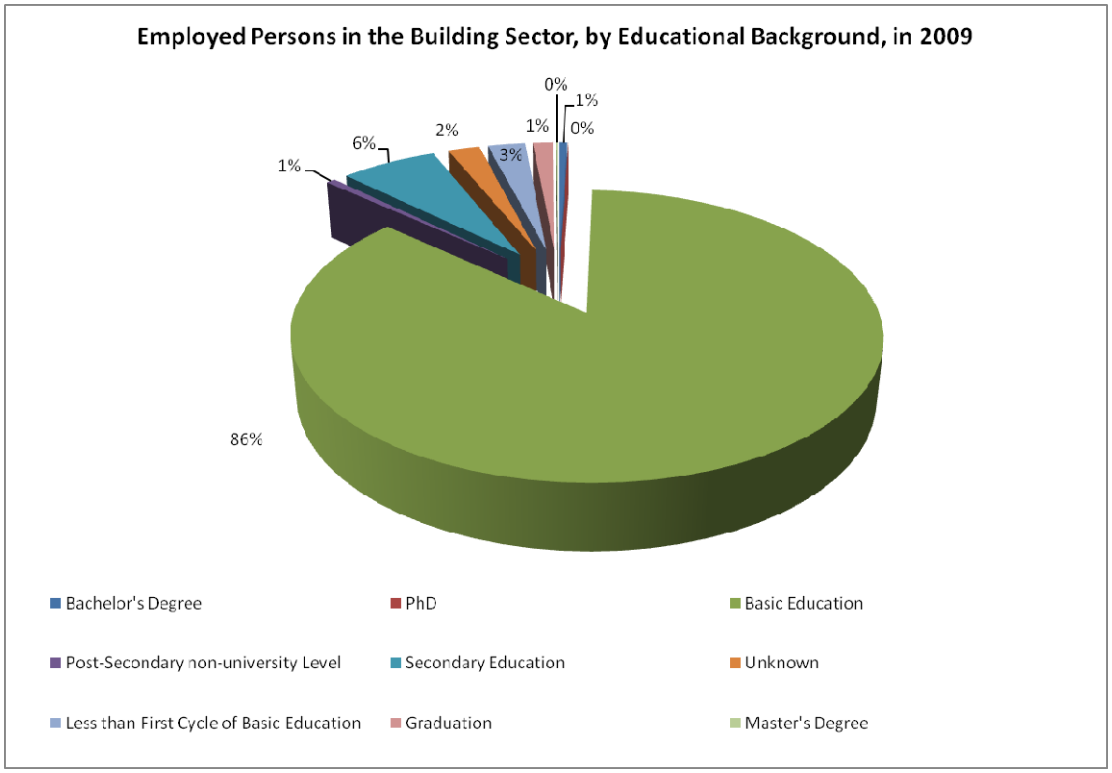


Figure 5.14 – Employed Persons in the Building Sector, by Educational Background.

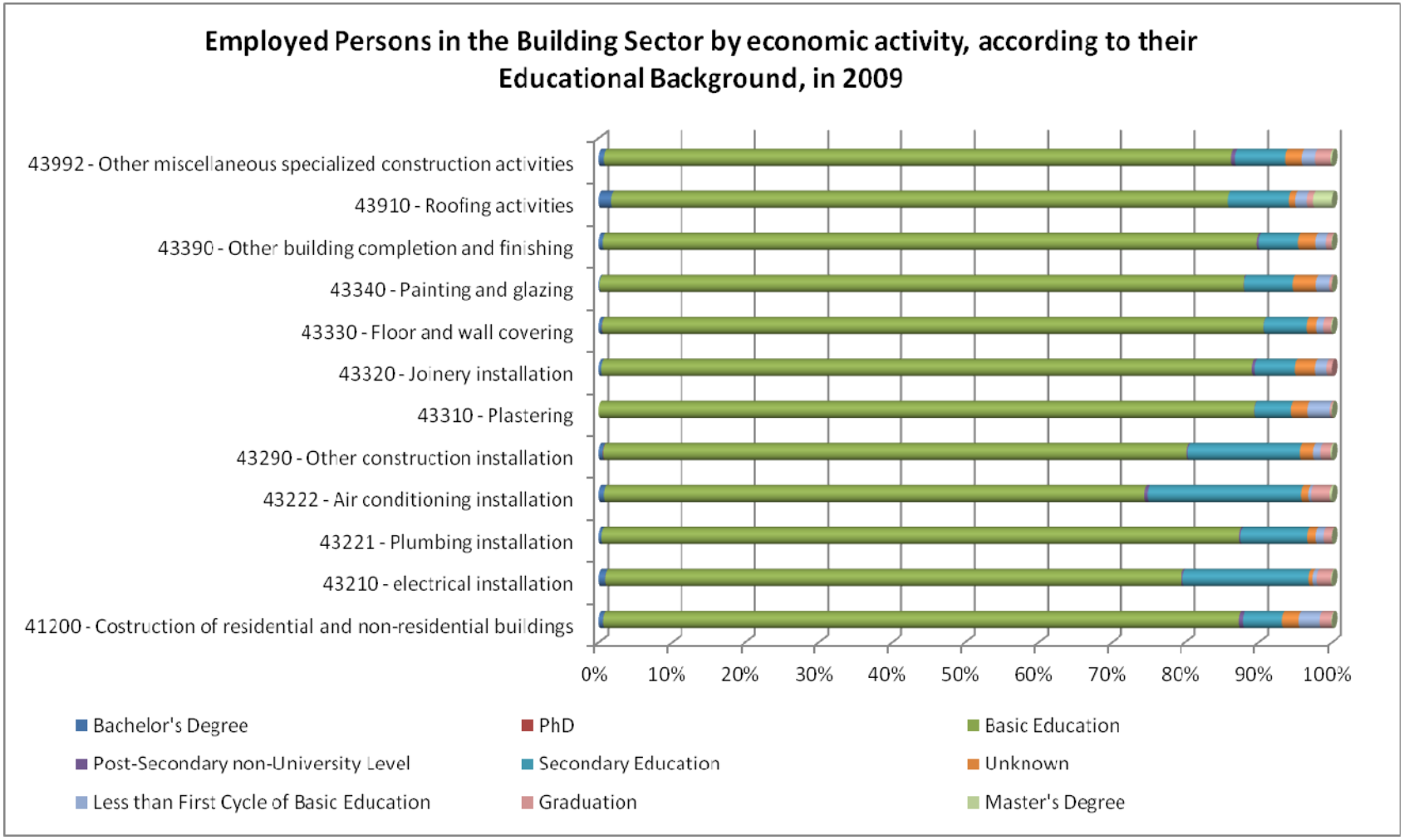


Figure 5.15 – Employed Persons in the Building sector by economic activity, according to their Educational Background.

We found out, while reviewing the **evolution of the educational background level** of workers registered in 2007 and 2009, that all educational levels, without exception, regressed. In concrete we found a marked decrease of professionals with post-secondary non-university levels in this sector (-48 percent), followed by -41.2 percent of professionals with Ph.D., -25 percent under the 1st level of primary school and e -17 percent with primary school (Figure 5.16).

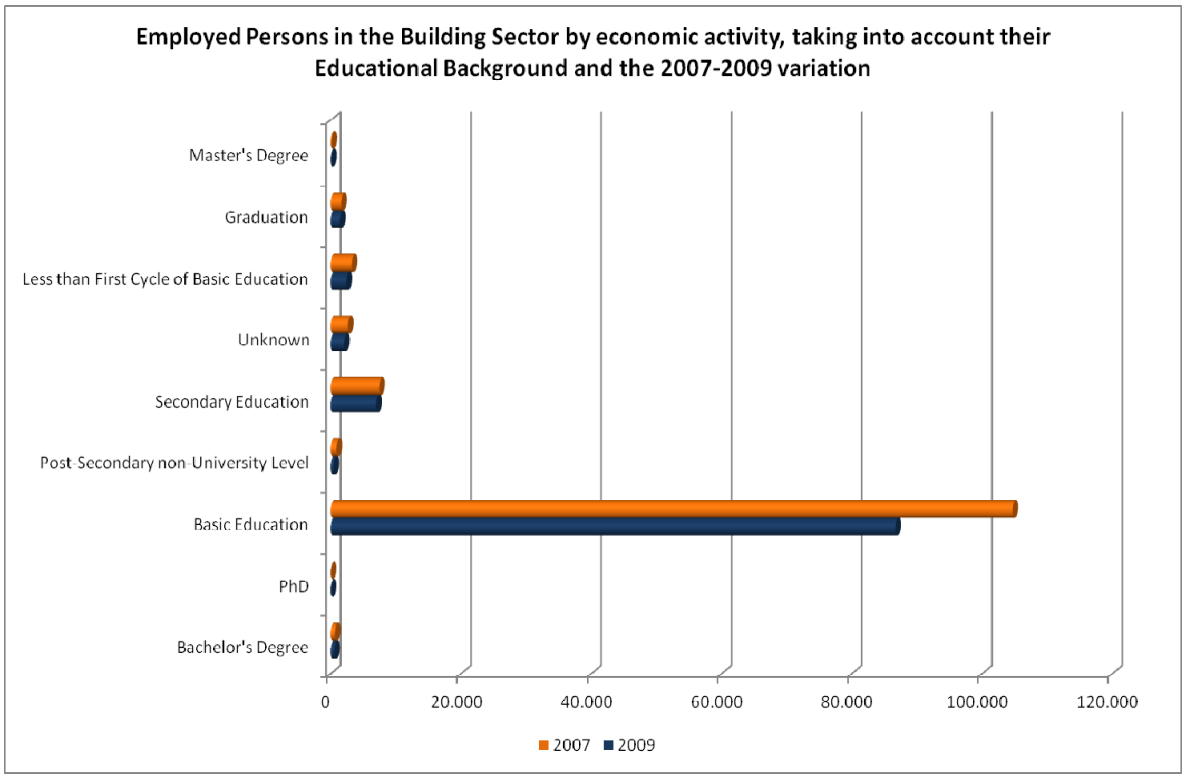


Figure 5.16 – Employed Persons in the Building sector by economic activity, taking into account their educational background and the 2007-2009 variation

5.4. Use of energy and renewable energies in buildings

5.4.1. Energy use in buildings

End-use energy consumption in buildings (household and services) is shown in Figure 5.17 for the last ten years, for which statistics are available (national energy balance). We can say that energy consumption in households and services, once deducted of road fuel consumption in the services sector, corresponds to energy consumption in buildings. Figure 5.14 shows the evolution of primary energy consumption in the same period.

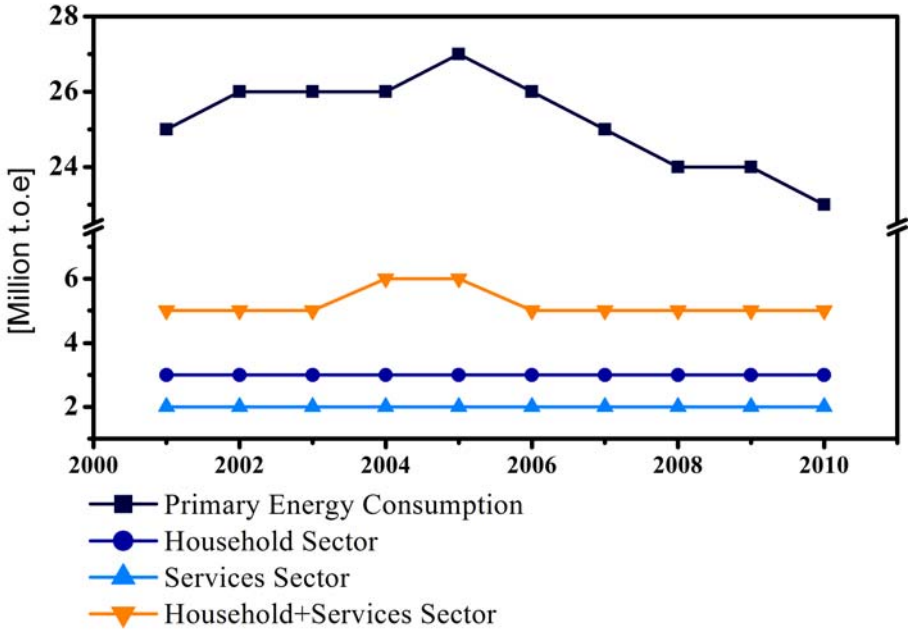


Figure 5.17 – Consumption of end-use energy in buildings (households and services) and primary energy consumption.

As shown, energy consumption in buildings behaves similarly to primary energy consumption, although the relative weight of this sector has grown in recent years, as evidenced by Figure 5.18.

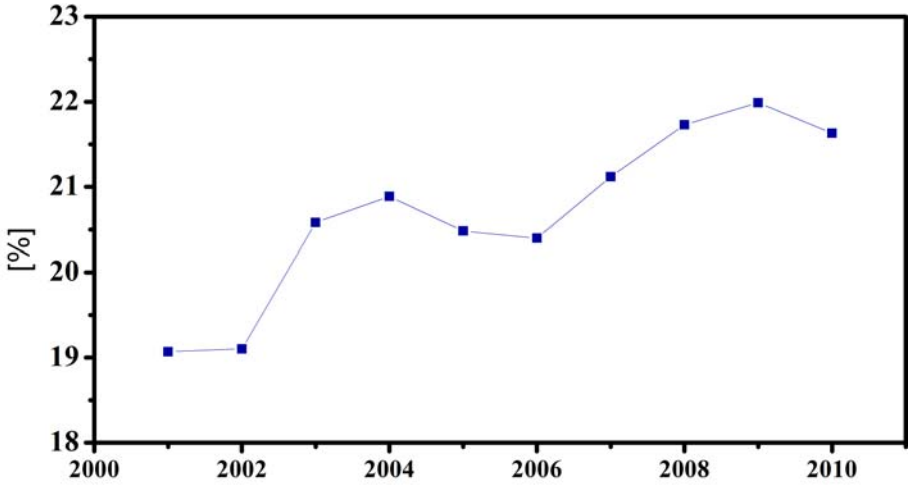


Figure 5.18 – Relative weight of energy consumption in buildings vis-à-vis primary energy consumption.

The main source of energy used in buildings, as regards consumption by energy source (Figure 5.19), is electricity, followed by LPG (liquefied petroleum gasses) and firewood & plant residues. As

shown, consumption of heating gas oil, fuel oil and LPG has dropped due to the growing penetration of natural gas, increasingly used in recent years.

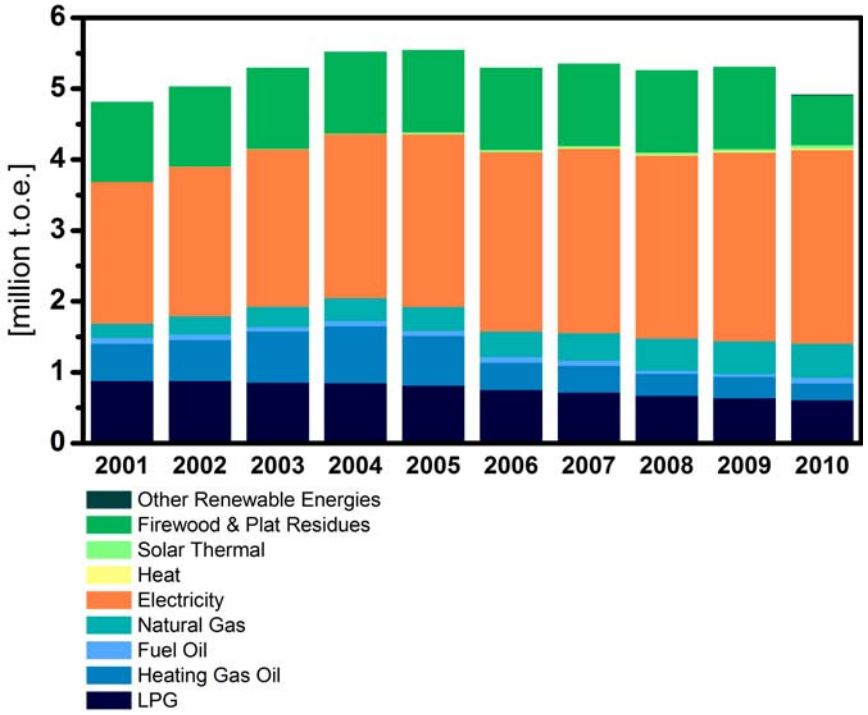


Figure 5.19 – Evolution of end-use energy consumption in buildings, by energy source.

We also found out an increased use of solar thermal energy, which only began to be recorded for energy balance purposes in 2005.

It should be noted that the amount identified for firewood & plant residues has been estimated as a function of studies based on household surveys. The last survey, dated 2010, made it possible to determine that the use of firewood & plant residues decreased significantly versus the 1986 study.

5.4.2. Latest available data

We present in Table 5.9, so as to correct the 2010 energy balance in view of the estimates obtained from households in the residential sector, a breakdown of energy consumption for the household and services sectors. Information has been extracted from the 2010 national energy balance (provisional data).

Table 5.9 – Energy balance (provisional data) for the household & services sector, 2010.

ENERGY SOURCE [T.O.E.]	HOUSEHOLDS (1)	SERVICES (2)	BUILDINGS (1+2)
LPG	554,479	52,382	606,861
Heating gas oil	124,636	113,993	238,629
Fuel oil	0	76,773	76,773
Natural Gas	282,613	199,575	482,188
Electricity	1,248,873	1,479,919	2,728,792
Cogeneration Heat	0	21,067	21,067
Solar Thermal	19,105	28,984	48,089
Firewood & Plant Residues	705,875	0	705,875
Other Renewables	0	10,270	10,270
TOTAL	2,936,231	2,017,694	4,953,925

Source: DGEG

A review of the above data shows that electricity is the largest component of energy consumption in the two sectors. In the household sector there is still significant consumption of firewood & plant residues, as well as LPG (butane and propane), while in natural gas and heating gas oil have some importance after electricity in services buildings.

It should be stressed that 50.2% of electricity used is obtained from renewable energy sources, according to the calculation method established under Directive 2001/77/CE.

Considering that primary energy consumption in Portugal amounted to 22.9 Mtoe in 2010, these two sectors represented 21.5 percent of total consumption. A 43.4 percent of this energy came from renewable energy sources.

Lastly we can draw from the Survey on Energy Consumption in the Household sector[31] the information shown in Table 5.10, regarding appliances installed in households for producing domestic hot water, space heating and space cooling.

Table 5.10 – Appliances for water heating, space heating and space cooling in dwellings.

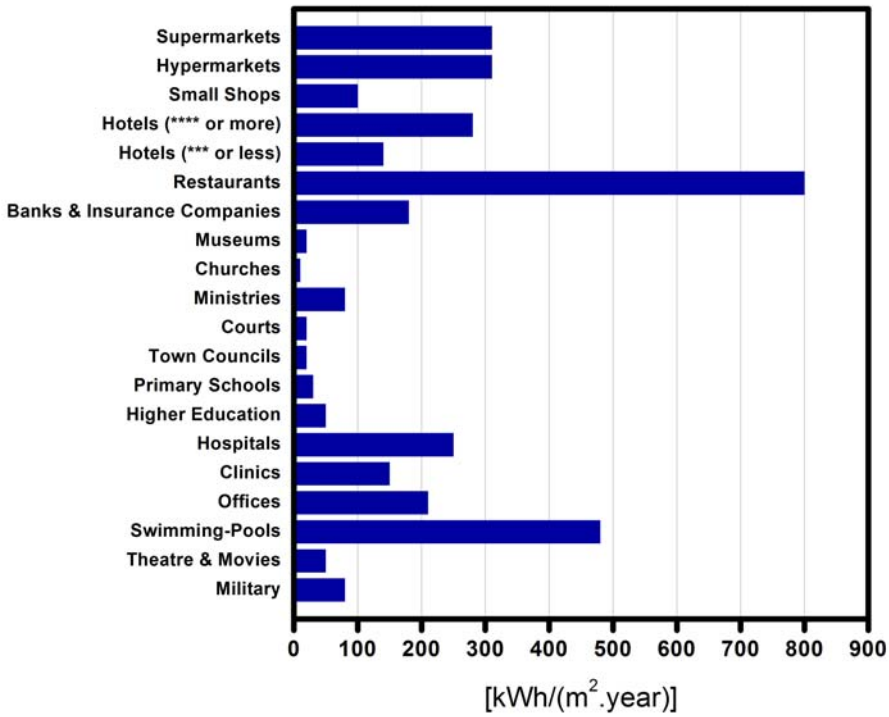
APPLIANCE	DWELLINGS [NO.]	DWELLINGS [%]	NO. OF APPLIANCES	APPLIANCES PER DWELLING
WATER HEATING				
Water heater	2,995,810	78.6	3,051,993	0.8
Thermo-accumulator	426,751	11.2	439,724	0.1
Boiler	455,406	11.9	458,817	0.1
Solar thermal system	68,824	1.8	68,824	0.0
SPACE HEATING				
Open fireplace	740 264	24.0	766,581	0.2
Fireplace with heat exchanger	340 498	11.1	346,204	0.1
Bear (firewood)	222 856	7.2	226,138	0.1
Boiler for central heating with water circulation	323 520	10.5	340,904	0.1
Stand-alone electrical heater	1,884,850	61.2	2,794,054	0.7
Stand-alone LPG heater	218,293	7.1	237,589	0.1
Air-conditioning for heating and cooling (Heat pump)	223,429	7.3	402,664	0.1
SPACE COOLING				
Stand-alone air-conditioning device	64,099	7.2	76,435	0.0
Ventilator (fan, wall fan)	615,128	69.5	756,108	0.2
Air-conditioning for heating and cooling (Heat pump)	230,063	26.0	399,432	0.1

Source: DGEG

Between 1990 and 1999 energy consumption in buildings increased more in services buildings (average 7.1 percent growth per year) than in residential buildings. These major electricity users were chiefly responsible for the marked growth of this end-use energy in Portugal. As a consequence the national percentage of electricity consumption in services buildings grew from 19 percent in 1980 to 31 percent in 1999.

This type of buildings is widely diversified, ranging from small stores using less energy than households to restaurants, indoor swimming-pools, hospitals, hotels and large shopping centres, with consumption levels among the highest in all buildings. Any intervention in this sector aimed at improving its energy performance must obviously be different by type of building, large consumers requiring priority action.

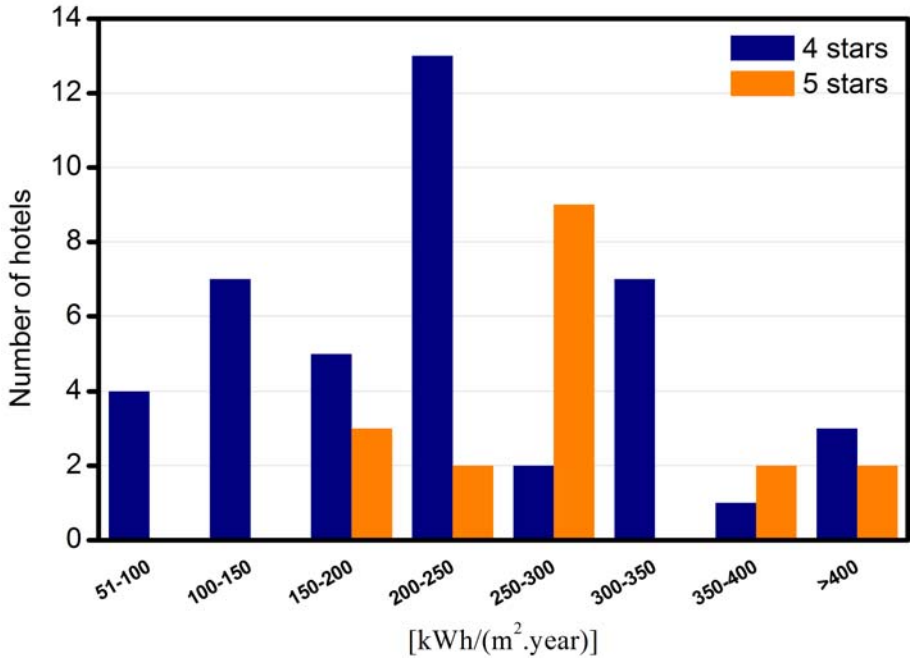
[31] DGEG (2010), Survey on Energy Consumption in the Household Sector.



Source: DGEG, 1994.

Figure 5.20 – Specific energy consumption by type of building.

Energy consumption is also widely diversified within each building type. We can actually identify a wide range of buildings, including the most energy efficient and the largest consumers, performing identical functions. A study on hotels and modern distribution[32] provided some information on energy sources, energy demand and a breakdown of energy demand per end use.



Source: DGEG.

Figure 5.21 – Specific end-use energy consumption in hotels.

[32] ADENE, 1999.

In the hotel sector, for example, the study focused on a sample of 60 4- and 5-star hotels located in Mainland Portugal and the Autonomous regions. It identified a widely different spectrum of end-use energy consumption (Figure 5.21), ranging from 50 to 600 kWh/m^2.year, with averages of 220 kWh/(m^2.year) (4-star) and 290 kWh/(m^2.year) (5-star).

We have also found that electricity represents, on the average, roughly 45 percent of end-use energy consumption. End uses generating the highest energy consumption levels are space heating and space cooling (approximately 30 to 35 percent), followed by domestic hot water (10 to 18 percent), kitchen (16 to 18 percent), lighting and laundry.

Hypermarkets and other modern distribution facilities are the other type of services buildings with a high energy consumption. In this case electricity is virtually the sole energy source (98 to 99 percent) and the main end use is, in shopping centres, air conditioning (heating and cooling, roughly 70 percent) and lighting (20 percent). In hypermarkets cold storage prevails, with nearly 35 percent, while air conditioning and lighting have the same magnitude (30 percent). Also there is a wide variation of consumption between more and less energy efficient units; in the latter consumption is twice as large as in those with lower consumption.

The growth dynamics of the building sector is also very strong, in terms both of the total number of existing buildings and the use of energy in each building. As a consequence an estimated growth of the annual energy consumption is expected of 4 to 7 percent, respectively in the household and services sectors. It is therefore essential to take action aimed at reducing energy consumption both in new and existing buildings.

6. Existing VET provisions

6.1. Vocational and educational training provided in the Framework of the National Qualifications System

6.1.1. The National Qualifications System (NQS)

The NQS aims to ensure that training and learning provided for personal development purposes and for modernising the corporate sector and the economy are relevant.

Having this in mind, as mentioned in Section 4 of this report, the NQS ensures that people have obtained the certified qualifications. Acquired skills are certified by completing a full training pathway in the framework of an initial training modality, or by completing a number of short-duration training units of the National Qualifications Catalogue (NQC) standards. These units can be credited for subsequently seeking qualification.

All training actions in the framework of the NQS, if not NQC-specified, grant a vocational training certificate that proves the successful completion of such training, allowing for the recognition of the acquired competences. NQS also provides an individual skills handbook for recording all competences acquired in a life time, both those mentioned on the National Qualifications Catalogue and all other training, even if provided by a non-certified training entity. The skills handbook exists since 2010 and is issued by SIGO – the database Information and Management System for the Educational and Training Supply.

6.1.1.1. CO-ORDINATION STRUCTURES OF THE NATIONAL QUALIFICATIONS SYSTEM

The national qualifications system is co-ordinated by the cabinet members responsible for the vocational training and education areas.

Departments responsible for executing the education and vocational training policies follow up and evaluate all different modalities.

The **National Agency for Qualification and Vocational Education (ANQEP)** was created in the framework of the NQS. ANQEP is a government body jointly supervised by the Ministry of the Economy and the Ministry of Education and Science, competent for co-ordinating the structure network and for following up, monitoring, evaluating and regulating the system, in close co-operation with the other member institutions of the National Qualifications System.

ANQEP set up the Sector -Councils for Qualification with the aim of updating the National Qualifications Catalogue (NQC), which is the strategic qualifications management instrument of the NQS. These councils are technical-consultative groups in charge of permanently identifying the updating needs of qualifications included in the NQC with a view to matching training with technological progress and sector-required competences, be it initial training be it lifelong learning.

Sector -Councils for Qualification are composed of, among others, experts appointed by the ministry responsible for the respective sector of activity, trade unions and employers' organisations representing the respective sectors of activity, reference companies, training entities with high-level expertise in the sector or region and independent experts.

Table 6.1 Sector Councils for Qualification.

CODE	SECTOR COUNCILS FOR QUALIFICATION
1	Food industry
2	Trade and marketing
3	Building and Urban Planning
4	Culture & Heritage and Content Production
5	Energy and environment
6	Chemical, ceramics, glass and other industries
7	Informatics, electronics and telecommunications
8	Wood, furniture and cork
9	Metallurgy and Metalwork
10	Fashion
11	Service to companies (financial activities, consulting, secretariat, etc.)
12	Personal services
13	Health and community services
14	Transportsand logistics
15	Tourism and leisure
16	Handicrafts and jewellery

Source: National Agency for Qualification and Vocational Education

A number of sector councils for qualification have taken significant action to identify the needs for skills and qualifications in the building sector and for promoting energy efficiency and RES development, both highly relevant to the purpose of this study. Special reference should be made to the following councils:

- Building and urban planning
- Energy and Environment
- Informatics, Electronics and Telecommunications
- Metallurgy and Metalwork

6.1.1.2. TRAINING PROVIDERS OF THE NATIONAL QUALIFICATIONS SYSTEM

The network of training entities of the national qualifications system are the basic and secondary schools, the private teaching establishments with recognised pedagogic plans or recognised public interest, vocational schools, centres for vocational training and vocational rehabilitation and private-sector entities with certified training structures, under the ministries responsible for vocational training and education, and the training entities attached to other ministries or other legal persons governed by public law.

In the concrete case of the building and energy sectors, special reference should be made to a few more relevant training entities of the National Qualifications System, namely:

- Centres for Training on Joint Management, of the Institute for Employment and Vocational Training's network, for the building sector:

  CICCOPN – Centre for Vocational Training of the Building and Public Works Industry of Northern Portugal

  CENFIC – Centre for Vocational Training of the Building and Public Works Industry of Southern Portugal

- Centres for Training on Joint Management of the Institute for Employment and Vocational Training's network, as well as the training centres specific to the sectors of electronics, energy and mechanical engineering:

  CINEL – Vocational Training Centre of the Electronics, Energy, Telecommunications and Information Technologies Industry

  APIEF – Vocational Training Centre for the Thermal, Energy and Environment Industry

  CENFIM – Vocational Training Centre of the Metalwork and Mechanical Engineering Industry

- Public or private-owned educational establishments, licensed to teach courses in the fields of education and training on building, energy and electricity:

  Basic and Secondary Schools of the public network

  Private-owned Vocational Schools supervised by the Ministry of Education

- Private training providers certified by the Directorate General for Employment and Labour Relations (DGERT) in the training areas relevant to the building & energy sector. These are training entities evaluated by DGERT, with minimum proven conditions in terms of their quality references as organisers of training activities, regarding their installed capacity, resource-wise, their practices inherent to the processes of training development and the results achieved.

6.1.1.3. CERTIFYING PROCESS OF TRAINING ENTITIES

The Certification System for Training Entities regulated by Ordinance no. 851/2010, of the 6 September, as specified in Cabinet Resolution no. 173/2007, of the 7 November, which approved the Reform of Vocational Training, and in Decree-Law no. 396/2007, of the 31 December, which established the National Qualifications System, replaced the Accreditation System for Training Entities which lasted for thirteen years. It is run by the competent central department of the ministry responsible for vocational training.

The Certification System for Training Entities, together with other mechanisms, is one of the instruments for assuring the quality of the National Qualifications System in Portugal. It recognises those pedagogic practices that are appropriate for training entities to develop training activities and audits the certified training provider on regular basis to evaluate compliance with certification requirements and results obtained with its activity.

The certification system for training entities is run by the Directorate General for Employment and Labour Relations (DGERT).

6.1.1.4. HOW IS TRAINING FINANCED IN THE FRAMEWORK OF THE NQS?

Training developed in the framework of the National Qualifications System (NQS) has two financing sources, i.e. Portugal's Stage Budget and the European Social Fund.

The National Strategic Reference Framework (QREN), a framework paper on the enforcement of the EU economic and social cohesion policy in Portugal in the 2007-2013 period, includes a Programme composed of actions aimed at financing Portugal's national education and training processes – the Operating Programme on Human Potential.

This programme's activity has been structured along 10 priority axes:

- Priority Axis 1 – Initial Qualification
- Priority Axis 2 – Adaptability and Lifelong Learning
- Priority Axis 3 – Management and Professional Improvement
- Priority Axis 4 – Advanced Training
- Priority Axis 5 – Support to Entrepreneurship and Transition to Active Life
- Priority Axis 6 – Citizenship, Inclusion and Social Development
- Priority Axis 7 – Gender Equality
- Priority Axis 8 – Algarve
- Priority Axis 9 – Lisbon
- Priority Axis 10 – Technical Assistance

Training developed in the framework of the NQS training modalities is financed by Axis 1, as regards initial training for young people, and by Axis 2, as regards initial and continuing training for adults.

6.1.2. How are qualifications organised in the National Qualifications Catalogue (NQC)?

The National Qualifications Catalogue (NQC), as mentioned in Section 4 of this report, is a strategic management instrument for non-higher qualifications, including all essential NQFs required to better match the training offer to the needs of companies, the labour market and citizens.

Accordingly all elements of the NQC are permanently updated with the support of the sector-specific boards for qualification, by including, excluding or changing qualifications as a function of the current and emerging needs of companies, economic sectors and individuals.

Qualifications incorporated in the NQC have been structured according to the levels of qualification defined by the National Qualifications Framework (NQF). NQF adopts the principles of the European Qualifications Framework (EQF) as regards the description of qualifications in terms of learning outcomes, in accordance with the descriptors associated with each qualification level, promoting qualification comparability as a function of its profile and not as a function of contents or training processes.

Qualifications have also been organised as a function of educational and training areas, which in some cases correspond to sectors of economic activity and are defined according to the National Classification of Education and Training Areas (CNAEF)[33].

Table 6.2. Education and Training Areas included in the National Qualifications Catalogue (NQC).

EDUCATION AND TRAINING AREAS			
213	Audio & Video and media production	543	Materials (wood, ceramics, cork and other)
215	Handicraft	544	Extractive industries
225	History and archaeology	582	Building and civil engineering
322	Library science, archives and documentation	542	Agricultural and animal production
341	Trade	622	Floriculture and gardening
342	Marketing and advertising	623	Forestry and hunting
343	Finance, banking and insurance	624	Fisheries
344	Accounting and taxation	725	Diagnosis and therapeutic technologies
345	Management and administration	729	Health
346	Secretariat and administrative work	761	Child and youth support service
347	Integration into organisations/companies	762	Social services
481	Computer sciences	811	Hotel and restaurant
521	Metallurgy and Metalwork	812	Tourism and leisure
522	Electricity and energy	813	Sports
523	Electronics and automation	815	Beauty care
524	Chemical processes technology	850	Environmental protection
525	Motor vehicles building and repairing	861	Protection of people and assets
541	Food industry	862	Safety and hygiene at work
542	Textile, clothing, footwear and leather industry		

Source: Ordinance no. 256/2005, of the 16 March.

Obtaining qualification means having the competences acquisition recognised and certified, in conformity with the standards established for the purpose. Such standards are the elements represented on Figure 6.1.

[33] Ordinance no. 256/2005, of the 16 March.

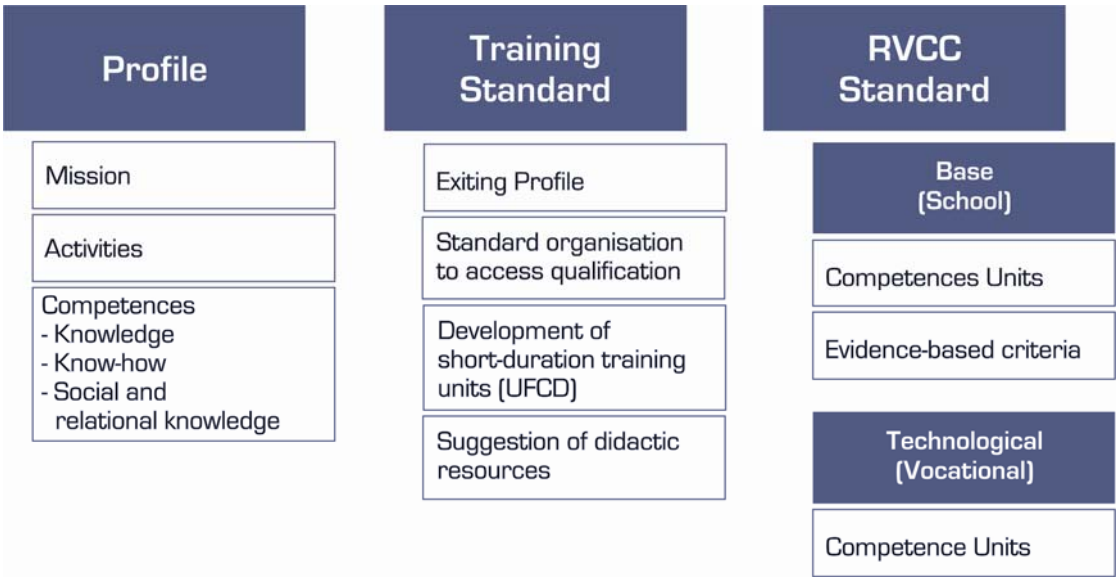


Figure 6.1 – NQC qualification standards

6.1.2.1. MODALITIES OF DOUBLE-CERTIFICATION EDUCATION AND TRAINING

NQS-incorporated qualifications are double-certification qualifications, meaning that they recognise a person's competences to develop one or more professional activities and they grant a schooling degree in the form of a diploma.

Qualifications can be accessed by way of a number of double-certification training modalities, targeted at either young people or adults, structured with reference to the NQC qualification standards.

Taking this into account, the Short-Duration Training Units (UFCD) scheduled for each training standard of NQC, structure the double-certification training offers, including the certified module-based training actions enabling a gradual and flexible double certification. They can also be used for continuing training.

Short-duration training unit (UFCD)
A learning unit, which can be autonomously certified and integrated into one or more training standards referred to in the National Qualifications Catalogue, making it possible to acquire the certified competences.

6.1.2.2. MODALITIES OF DOUBLE-CERTIFICATION TRAINING TARGETED AT YOUNG PEOPLE

Vocational Courses – level 4 of qualification
Secondary-level education courses, scheduled for the initial training of young people, promoting their integration into the labour market and enabling them to continue their studies *(Ordinance no. 550-C/2004)*.

Apprenticeship Courses – level 4 of qualification
Initial vocational training courses for young people, work-linked, promoting their integration into the labour market and enabling them to continue studies. Their completion grants the secondary school degree.
(Ordinance no. 1497/2008)

6.1.2.3. MODALITIES OF DOUBLE-CERTIFICATION TRAINING TARGETED AT ADULTS

Education and Training Courses for adults (EFA) – level 2 and level 4 of qualification
Courses for individuals with 18 years-old, or more, unqualified or without appropriate qualification, for the purpose of integration, re-integration and progress in the labour market, who have not finished basic education or secondary education. *(Ordinance no. 283/2011)*

Certified Modular Training
Training developed by attending any short-duration training units (UFCD) that are part of base training and/or the technological training of any CNQ standard, of level 2 or level 4 of qualification, targeted at adults in the framework of continuing training. *(Ordinance no. 283/2011)*

6.1.2.4. MODALITIES OF DOUBLE-CERTIFICATION EDUCATION AND TRAINING, TARGETED AT THE NON-UNIVERSITY POST-SECONDARY LEVEL

Technological specialisation courses – level 5 of qualification
Courses targeting a specialised technical training for the purpose of integration, re-integration and progress in the labour market, for individuals who have finished or hold a secondary education degree, or higher, enabling them to continue their studies. *(Decree-Law no. 88/2006)*

6.1.2.5. CONTINUING TRAINING IN THE FRAMEWORK OF THE NATIONAL QUALIFICATIONS SYSTEM

The National Qualifications System defines continuing training as any education & training activity developed after leaving the schooling system, or after joining the labour force, which enables the individual to improve his/her professional and relational competences with a view to developing one or more professional activities, better adapting to technological and organisational change and strengthening his/her employability.

The short duration training units (UFCD) of the NQC are the basis for double-certification continuing training, carried out by certified training entities, vocational training centres of the IEFP network or teaching establishments, which constitute the entity network of the national qualifications system. These entities grant a qualifications certificate, proving that such UFCDs were successfully completed, contributing to obtain a qualification certified by a qualifications diploma.

NQS also determines that a vocational training certificate governed by law[34] be issued for all certified training activities not included in the NQC, when such activities are developed by an entity certified for this purpose, or by teaching establishments recognised by the competent ministry – that is to say, training entities belonging to the national qualifications system.

[34] Ordinance no. 474/2010, of the 8 July.

6.1.2.6. CHARACTERISATION OF THE CURRICULUM MATRICES OF EACH EDUCATION & TRAINING MODALITY

In the table below we can find the manner in which each main training modality is organised, according to each different training component and respective time Schedule, as follows:

- Vocational Courses (level 4 of qualification)
- Apprenticeship Courses (level 4 of qualification)
- Education & Training Courses for Adults (EFA) (levels 2 and 4 of qualification)
- Certified Modular Training

Table 6.3 – Training components and respective time schedules (number of hours) of training courses, by modality of level-4.

NQF LEVEL-4 QUALIFICATION									
INITIAL TRAINING FOR YOUNG PEOPLE							INITIAL TRAINING FOR ADULTS		
APPRENTICESHIP COURSES				VOCATIONAL COURSES			EDUCATION & TRAINING FOR ADULTS (EFA) (A,B,C, FLEXIBLE-RVCC)*		
Training components	Competence areas	Training fields/units	Number of hours	Training components	Disciplines	Number of hours	Training components	Competence areas	Number of hours
SOCIO-CULTURAL	Languages, culture and communic-ation	Living in Portuguese	240-280	SOCIO-CULTURAL	Portuguese	320	BASE	Citizenship and professionalism	100 - 550
		Communicating in: (foreign language)	200		Foreign Language	220			
		ICT	100		ICT	100			
	Citizenship and society	Contemporary World	80-110		Integration Area	220		Society Technology and Science	
		Social and personal development	80-110		Physical Education	140			
TOTAL			700 - 800		TOTAL	1000		Culture, Language and Communication	
SCIENTIFIC	Basic Sciences	Maths and the real world	200-400	SCIENTIFIC	2/ 3 basic scientific disciplines	500			
		Other basic sciences							
TOTAL			200-400		TOTAL	500		TOTAL	100 - 550
TECHNOLOGICAL	Technologies	Specific technologies	800-1000	TECHNICAL	3/ 4 disciplines of technological, technical and practical character	1180	TECHNOLOGICAL	Technologies – depending on the technology standard associated with the qualification	1200
					On-the-job training	420			
		TOTAL	800 - 1000		TOTAL	1600		TOTAL	1200

NQF LEVEL-4 QUALIFICATION									
INITIAL TRAINING FOR YOUNG PEOPLE							INITIAL TRAINING FOR ADULTS		
APPRENTICESHIP COURSES				VOCATIONAL COURSES			EDUCATION & TRAINING FOR ADULTS (EFA) (A,B,C, FLEXIBLE-RVCC)*		
Training components	Competence areas	Training fields/units	Number of hours	Training components	Disciplines	Number of hours	Training components	Competence areas	Number of hours
Practical	On-the-job training		1100-1500				LRP	Learning-reflecting portfolio	65 - 85
TOTAL CA: 2800-3700					Total CP: 3100		Practical	On-the-job training	210
							TOTAL EFA: 1575 - 2045		

*The highest the education background level required, the shorter the training period

Table 6.4 – Training components and respective time schedules (number of hours) of the NQF Level-2 Education & Training Courses for Adults (EFA) (B2-B3, FLEXIBLE/RVCC)*

TRAINING COMPONENTS	COMPETENCE AREAS	NUMBER OF HOURS
Autonomous learning	Consolidate integration into group Team work Learning how to learn	40
Base	Citizenship and employability	900-1350
	Language and Communication Maths for life ICT	
Technological	Technologies – dependent upon the technological standard associated with the qualification	1000
Practical	On-the-job training	≥ 120
TOTAL EFA:		1940-2390

* The highest the education background level required for admission, the shorter the training period

Source: National Agency for Qualification and Vocational Education

Table 6.5 – Training components and respective time schedules (number of hours) of the certified modular training for employed or unemployed active workers. NQC short-duration training units (UFCD) of NQF Level 2 and Level 4 qualification pathways.

	TRAINING STRUCTURE		
NUMBER OF HOURS	BASE TRAINING	TECHNOLOGICAL TRAINING	BOTH TRAINING COMPONENTS*
25 - 300 Hours	X	X	X
>300 - 600 Hours*	X	-	X

*In this kind of training, 1/3 of the number of hours should result from UFCD of the base training component

Source: National Agency for Qualification and Vocational Education

6.1.3. Qualifications related to the education & training areas of the Energy & Electricity and Building & Civil Engineering Sectors

6.1.3.1. ARTICULATION BETWEEN EDUCATION & TRAINING AREAS, NQS/NQC QUALIFICATIONS AND EDUCATION & TRAINING MODALITIES

In short, table below lists the qualifications incorporated in the National Qualifications System and currently included in the National Qualifications Catalogue for educational & training areas with vocational opportunities in the building sector, aimed at acquiring competences in energy efficiency and use of renewable energy sources.

Qualifications should be construed as “the formal outcome of an evaluation and validation process ratified by a competent body, recognising that an individual has acquired competences in accordance with the established standards”, pursuant to Decree-Law no. 396/2007, of the 31 December.

In this context the table below shows the qualifications resulting from courses developed in the framework of different education & training modalities.

It should also be stressed the training standards associated with different qualifications may respond to several professional activities, which may or not be covered by specific regulation, as are the TIM 2, TIM 3 and TQAI specialisations.

Notwithstanding NQC does not yet cover today, by way of its incorporated qualifications, all the specialisations of these sectors that may be subjected to some kind of regulation, namely the case of TQAI.

Table 6.6 – Offer of qualifications by education & training area and by modality

		NATIONAL QUALIFICATIONS CATALOGUE			
		TRAINING FOR YOUNG PEOPLE		TRAINING FOR ADULTS	
EDUCATION & TRAINING AREA	NQF LEVEL	Vocational Courses	Learning Courses	EFA Courses	Certified Modular Training
225 – History and archaeology					
Built Heritage Recovery Technician	4	X			
521 – Metalwork and mechanical engineering					
Constructional Ironwork Fitter-Machinist[35]	2			X	X
Welder	2			X	X
522 – Electricity and energy					
Electrical Installation Technician	4	X	X	X	X
Electrician	4	X	X	X	X
Cold Storage and Climatisation Technician	4	X			
HVAC Systems Technician	4		X	X	X
HVAC Systems Designer	4		X	X	X
Gas Technician	4	X	X	X	X
Renewable Energies Technician (4 types)	4	X			
Bio-energy Systems Installer	4		X	X	X
Wind Energy Systems Installer	4		X	X	X
Solar Photovoltaic Systems Installer	4		X	X	X
Solar Thermal Systems Installer	4		X	X	X
Electrical Installation Electrician-Assembler	2			X	X
Electrical fitter of Home Appliances	2			X	X
Electrical fitter of HVAC equipment – Domestic and Commercial Systems	2			X	X
523 – Electronics and automation					
Electronics, Automation and Instrumentation Technician	4	X	X	X	X
Electronics, Automation and Control Technician	4	X	X	X	X
Electronics and Telecommunications Technician	4	X	X	X	X
543 – Materials					
Clen Carpenter	2			X	X
582 – Building and civil engineering					
Building civil engineering architectural technician (6 types)	4	X			
Draughtsman	4		X	X	X
Project Supervisor	4		X	X	X
Land Surveyor	4		X	X	X
Measuring Surveyor	4		X	X	X
Mason	2			X	X
Floor and Wall Tiler	2			X	X
Building Painter	2			X	X
CAD Operator – Building	2			X	X
Plumber	2			X	X

6.1.3.2. TRAINING CONTENTS

We now present, for the qualifications identified in the National Qualifications System (NQS) and incorporated into the National Qualifications Catalogue (NQC), associated with activities/occupations of the Building & Energy Sector, an illustrative table of some training NQFs aimed at the skills required to obtain the identified qualifications.

As an example, we selected the following qualifications; mason, HVAC technician and solar thermal systems fitter-installer.

[35] Including Installer of Light Windows and Façades.

Table 6.7 – Examples of training contents and associated skills for 3 NQC qualifications

NQC TRAINING STANDARDS			
QUALIFICATION	QUALIFICATION LEVEL	SHORT-DURATION TRAINING UNITS (UFCD)	TARGETED SKILLS
Mason	2	Workplace organisation and procurement of materials "Parede a meia vez"[36], with 23x11x7 bricks – end wall down "Parede a meia vez"[37], with 23x11x7 bricks – end wall up Wall with corner in 30x20x15 cast brick Wall finishing Procurement of pipes, sewage pipes and laying structures. Mortar preparation. Pressed brick masonry, topped with pillar Brick masonry with doorway and window Double wall with doorway Laying electrical boxes, sewers and others Inspection pits, gutters and drains Procurement of wood planks and reinforcing bars for formwork and concrete preparation Making formwork – shoe and pillar Making formwork – wall, latching strap and beam Making formwork - slabs	1. Interpret design pieces, sketches and other schedules of conditions. 2. Identify and characterise the materials, equipment, tools and auxiliary tools required for the work to be done. 3. Use alignment marking and signalling techniques for laying the foundations. 4. Use preparation techniques for filling the base of foundations. 5. Use foundation filling techniques. 6. Use structure-marking techniques. 7. Use formwork filling techniques. 8. Use techniques for making and assembling precast units. 9. Use rigging floor-making techniques. 10. Use reference-marking techniques to make the masonry. 11. Use mix- and mortar-preparation techniques. 12. Use methods and techniques for making masonry with natural and man-made components. 13. Use beam and lath-work marking and assembling techniques. 14. Use moulded lath-work marking and making techniques. 15. Use roof-tile (and other roofing materials) laying techniques. 16. Use roof gutter-making techniques. 17. Use techniques for laying rainwater drains. 18. Use techniques for making settling- and finishing-screeds. 19. Use plaster making techniques. 20. Use techniques for laying ceramic tiles, hydraulic mosaic and natural/man-made stone units on floors. 21. Use techniques for laying glazed-tiles and natural/man-made stone units on walls. 22. Use methods and techniques required to dismount covers, roofs, structures and other construction units. 23. Use methods and techniques required to partially demolish buildings and other construction works. 24. Use shoring and pit-lining methods and techniques. 25. Use techniques for marking alignments and levels, while doing different basic sanitation works and others. 26. Use techniques required for making and/or laying boxes, sinks, gutters and traversing units. 27. Using tube- and pipe-laying techniques. 28. Use techniques for laying kerbs and other prefabricated units. 29. Use methods and techniques required for making and/or laying septic tanks and absorbing wells. 30. Use box-laying techniques for technical installations. 31. Use techniques required for laying bathtubs and other similar equipment. 32. Use natural and man-made stonework, together with prefabricated concrete units, in door and window frames. 33. Use siding mortar for door and window frames. 34. Use techniques for laying ironwork units. 35. Use quality control techniques for the work. 36. Use cleaning and conservation procedures for work tools.

[36] Type of wall

NQC TRAINING STANDARDS

QUALIFICATION	QUALIFICATION LEVEL	SHORT-DURATION TRAINING UNITS (UFCD)	TARGETED SKILLS
HVAC Technician	4	Technical Design – standardisation and geometric constructions Technical Design – orthogonal projections Mechanical Technology – basic principles of materials Mechanical Technology – basic workshop procedures Applied thermodynamics – thermometry and calorimetry Applied thermodynamics – heat transfer Practice of Manufacturing techniques – Key operations Practice of Manufacturing techniques – operations on plate and tubes Practice of Manufacturing techniques – plate and tube welding Technical design – isometric approach Technical design – isometric approach to tubes and ducts Technical design – group elements Mechanical Technology – general composition of thermal machinery Mechanical Technology – installation processes and compressors Applied Thermodynamics – behaviour of gasses versus the thermodynamic variables Applied Thermodynamics – thermal machines Applied Thermodynamics – compressor selection and dimensioning of lines, capacitors and evaporateurs Practice of manufacturing techniques – operations of metalwork and thermal machinery manufacturing Technical Design - boilers Technical Design – schematic electrical circuitry Electricity and Electronics – electricity and electrical measures Electricity and Electronics – electromagnetism and electromagnetic control circuitry Electrical Installations Practice – assembling of electrical circuits and of the motocompressor group Electrical Installations Practice – assembling and conservation of electrical components Installation and Assembling Practices – installation of high-capacity machines	1. Interpret schedules of conditions regarding the installation and maintenance of commercial and industrial cooling systems. 2. Interpret schedules of conditions regarding the installation and maintenance of domestic, commercial and industrial HVAC systems. 3. Apply organisation and distribution criteria to works that must be done. 4. Use the procedures and techniques for planning & acquiring equipment, components, tools and materials utilised in the installation and maintenance of commercial and industrial cooling systems. 5. Use the procedures and techniques for planning & acquiring equipment, components, tools and materials utilised in the installation and maintenance of domestic, commercial and industrial HVAC systems. 6. Use the techniques and processes of preparation of equipment, components, tools and materials appropriate for the installation and maintenance of commercial and industrial cooling systems. 7. Use the techniques and processes of preparation of equipment, components, tools and materials appropriate for the installation and maintenance of domestic, commercial and industrial HVAC systems. 8. Identify and characterise different types of equipment, components, tools and materials utilised for the installation and maintenance of commercial cooling systems. 9. Identify and characterise different types of equipment, components, tools and materials utilised for the installation and maintenance of industrial cooling systems. 10. Identify and characterise different types of equipment, components, tools and materials utilised for the installation and maintenance of domestic and commercial HVAC systems. 11. Identify and characterise different types of equipment, components, tools and materials utilised for the installation and maintenance of industrial HVAC systems. 12. Use tools and materials required for the installation and maintenance of commercial and industrial cooling systems 13. Use tools and materials required for the installation and maintenance of domestic, commercial and industrial HVAC systems . 14. Apply the methods and techniques required for evaluating the physical conditions of the site selected for the installation of commercial and industrial cooling systems and their objective 15. Apply design-making methods and techniques. Apply connection-making methods and techniques. 16. Use the equipment-assembling and connection-making procedures and techniques appropriate for the installation of commercial cooling systems. 17. Use the equipment-assembling and connection-making procedures and techniques appropriate for the installation of industrial cooling systems. 18. Apply the procedures, methods and techniques required for checking and trying the operation of commercial cooling systems. 19. Apply the procedures, methods and techniques required for checking and trying the operation of industrial cooling systems. 20. Provide technical guidance to the tasks of installation and maintenance of commercial and industrial cooling systems.

NQC TRAINING STANDARDS

QUALIFICATION	QUALIFICATION LEVEL	SHORT-DURATION TRAINING UNITS (UFCD)	TARGETED SKILLS
HVAC Technician	4	Installation and Assembling Practices – installation of air-conditioning systems Instrumentation and control – basic regulation principles and instrumentation complements CAD 2D – HVAC and cooling Mechanical technology – maintenance techniques Applied Thermodynamics – air transformation states Applied Thermodynamics – heating boilers Applied Thermodynamics – fluid heating systems Applied Thermodynamics – heat-pump heating systems Electricity and Electronics – alternating current Electricity and Electronics – semiconductor circuits and transistors Electrical Installations Practice – electrical component checking and assembling. Manufacturing organisation – work preparation Manufacturing organisation – manufacturing management Manufacturing organisation – inventory management and logistics Manufacturing techniques practices – exchanger manufacturing Electricity and Electronics – alarm, command and control circuit diagrams Electricity and Electronics – automata programming Installation and Assembling Practices – installation of heating system Installation and Assembling Practices – installation of cooling system Maintenance practice – maintenance of motocompressor groups Maintenance practice – tower and duct maintenance	21. Apply the methods and techniques required for evaluating the physical conditions of the site selected for the installation of domestic, commercial and industrial HVAC system and their objective 22. Use the equipment-assembling and connection-making procedures and techniques appropriate for the installation of domestic and commercial HVAC systems. 23. Use the equipment-assembling and connection-making procedures and techniques appropriate for the installation of industrial HVAC systems. 24. Apply the procedures, methods and techniques required for checking and trying the operation of industrial HVAC systems 25. Provide technical guidance to the tasks of installation and maintenance of domestic, commercial and industrial HVAC systems. 26. Use techniques and procedures required for cleaning commercial and industrial cooling systems. Use techniques and procedures required for cleaning domestic, commercial and industrial HVAC systems. 27. Use techniques and procedures required for replacing components of commercial and industrial cooling systems. 28. Use techniques and procedures required for replacing components of domestic, commercial and industrial HVAC systems. 29. Identify operating anomalies of commercial cooling systems. Identify operating anomalies of industrial cooling systems. 30. Apply the techniques and procedures required for repairing commercial cooling systems. 31. Apply the techniques and procedures required for repairing industrial cooling systems. Identify operating anomalies in domestic and commercial HVAC systems. 32. Identify operating anomalies in domestic and industrial HVAC systems. 33. Apply the techniques and procedures required for repairing domestic and commercial HVAC systems. 34. Apply the techniques and procedures required for repairing industrial HVAC systems. 35. Speak and write in a way that makes communication easy with costumers and other interlocutors. 36. Apply budgeting methods and techniques. Use technical documentation required for recording the developed activity. 37. Apply the safety, hygiene, health and environmental protection standards associated with the professional activity.

NQC TRAINING STANDARDS

QUALIFICATION	QUALIFICATION LEVEL	SHORT-DURATION TRAINING UNITS (UFCD)	TARGETED SKILLS
Solar Thermal Systems Installer Térmicos	4	Metrology - Introduction Metrology – Techniques and instruments Materials Technology Mechanics of Materials Manufacturing Processes Corrosion Pneumatics and Hydraulics Environment, Safety, Hygiene and Health at Work – elementary notions Company Quality and reliability Work preparation, planning and budgeting Maintenance management – introduction Project management Technical design – introduction to CAD, geometrical drawing and descriptive geometry Technical Design – representation and dimensioning of parts Technical Design – connection units and outline drawing Technical Design – building design notions Bench ironwork – elementary operations Machining – elementary operations Connection processes Electricity Electrical industrial installations Automatisms - introduction Fluid mechanics Maintenance of machines and equipment Thermodynamics Energies Solar energy Solar thermal systems Solar thermal collectors Solar thermal system design – selection and scaling Solar thermal system design – construction Solar thermal system design - installation	1. Use planning and work organisation techniques. 2. Use appropriate techniques for designing projects of small-scale solar thermal systems. 3. Interpret designs for the installation of solar thermal systems. 4. Identify the equipment and accessories to be installed and the physical conditions required to install solar thermal systems. 5. Select the working methodology and materials required to develop activities aimed at installing, maintaining and repairing solar thermal systems. 6. Identify different work phases to be completed and the activities inherent to each of them. 7. Apply the health and safety standards and procedures concerning the professional activity. 8. Identify the characteristics and operating procedures of solar thermal systems. 9. Identify and use techniques for installing solar thermal systems. 10. Identify different types of materials and their behaviours, as well as the equipment to be used for installing solar thermal systems. 11. Identify and use measurement and control equipment appropriate for the installation, start-up and anomaly diagnosis of solar thermal systems. 12. Identify and use trial techniques for solar thermal systems. 13. Identify anomalies in solar thermal systems. 14. Define and use techniques for repairing solar thermal systems, in accordance with the detected anomaly. 15. Identify and use maintenance techniques for solar thermal systems. 16. Use the technical documentation for recording the developed activity.

6.1.3.3. ARE THE OCCUPATIONS INCLUDED IN THE NATIONAL CLASSIFICATION OF OCCUPATIONS WELL ARTICULATED WITH THE NQS/NQC QUALIFICATIONS OFFER?

The table below shows data about the training offer provided in the framework of the national qualifications system (NQS), regarding professional opportunities, and the occupational activities of the building & energy sector identified in the National Classification of Occupations. Thus we can identify the existing match.

It should be noted that, for the same occupational activity/occupation, the National Qualifications System provides more than one education & training modality to obtain the respective competences.

Table 6.8 – Offer of qualifications targeted at occupations within the National Classification of Occupations

		NATIONAL QUALIFICATIONS CATALOGUE (NQC)				
		TRAINING FOR YOUNG PEOPLE		TRAINING FOR ADULTS		POST-SECOND. TRAINING
NATIONAL CLASSIFICATION OF OCCUPATIONS	NQF Level	Vocational Courses	Apprenticeship Courses	EFA Courses	Module-based Training	CET
Building Civil Engineering Architectural Technician	5					X
Measuring Surveyor	4	X	X	X	X	
Electrical installation technician	4	X	X	X	X	
HVAC technician	4	X	X	X	x	
Maintenance man (electricity)	4	X	X	X	x	
Electrical network technician	-	-	-	-	-	-
Chief Draughtsman	-	-	-	-	-	-
Draughtsman	4	X	X	X	X	
Mason	2			X	X	
Refractory Bricklayer	-	-	-	-	-	-
Reinforcement Concreter	-	-	-	-	-	-
Concrete Spreader Operator	2			X	X	
Masonry (Prefabricated) Machine Operator	-	-	-	-	-	-
Masonry (Prebabricated) Assembler	-	-	-	-	-	-
Pre-stressed Concrete Assembler	-	-	-	-	-	-
Construction Foreman	4	X	X	X	X	
Trim Carpenter	2			X	X	
Carpenter	-	-	-	-	-	-
Glazier	-	-	-	-	-	-
Plumber	2			X	X	
Pipe fitter	-	-	-	-	-	-
Painter	2			X	X	
Chimney sweep	-	-	-	-	-	-
Electrical fitter of lifts and similar equipment	-	-	-	-	-	-
Electrical fitter of HVAC equipment	2			X	X	
Electrician-assembler of High Voltage installations	-	-	-	-	-	-
Electrician-assembler of Low Voltage installations	2			X	X	
Network Electrician (electrical energy distribution)	-	-	-	-	-	-
Solar Thermal Systems Installer	4	X	X	X	X	
Solar Photovoltaic Systems Installer	4	X	X	X	X	
Bio-energy Systems Installer	4	X	X	X	X	

6.1.4. Training offer's quantitative data

6.1.4.1. APPRENTICESHIP COURSES - LEVEL 4 OF QUALIFICATION

Courses are delivered by vocational training centres of the IEFP, I. P. network, other entities supervised by the ministry in charge of vocational training and by public and private training entities duly certified in the framework of the training entities certification system.

This work-linked modality aims to certify young people to enter the labour market. In what concerns education & training areas, most students attend courses to obtain qualifications in the electricity & energy area, as regards both production and their use in connection with buildings' functionality – i.e. 71 percent, with particular reference to qualifications in electrical installations, HVAC and installation of solar thermal systems.

As regards this training offer, building & civil engineering is the education & training area with the highest student attendance.

Table 6.9. – No. of students registered in Apprenticeship Courses on the 31 December 2011

			NUT II			
COURSES – TRAINING DELIVERED IN 2011	Alentejo	Algarve	Central Portugal	Lisbon	Northern Portugal	TOTAL
Building & Civil Engineering	5	15	29	27	186	262
Draughtsman	5	15			78	98
Measuring Surveyor			9	12	21	42
Project Supervisor			9	15	55	79
Land Surveyor			11		32	43
Electricity and Energy	56	43	202	352	833	1486
Electrician					12	12
Gas Technician					16	16
Electrical Installation Technician	6	7	59	76	188	336
Cold Storage and Climatisation	40	26	41	94	220	421
Bio-Energy Systems Installer				20	49	69
Wind Energy Systems Installer			17	20	31	68
Solar Photovoltaic Systems Installer	10		32		144	186
Solar Thermal Systems Installer		10	53	142	173	378
Electronics & Automation			35	57	263	355
Electronics and Telecommunications Technician			35	47	188	270
Electronics, Automation and Control Technician				10	75	85
TOTAL	61	58	266	436	1282	2103

Figure 6.2 allows for a more objective view of the highest incidence of students in courses seeking qualifications as solar thermal systems installers, cold storage and climatisation and electrical installations, within the electricity & energy education and training area.

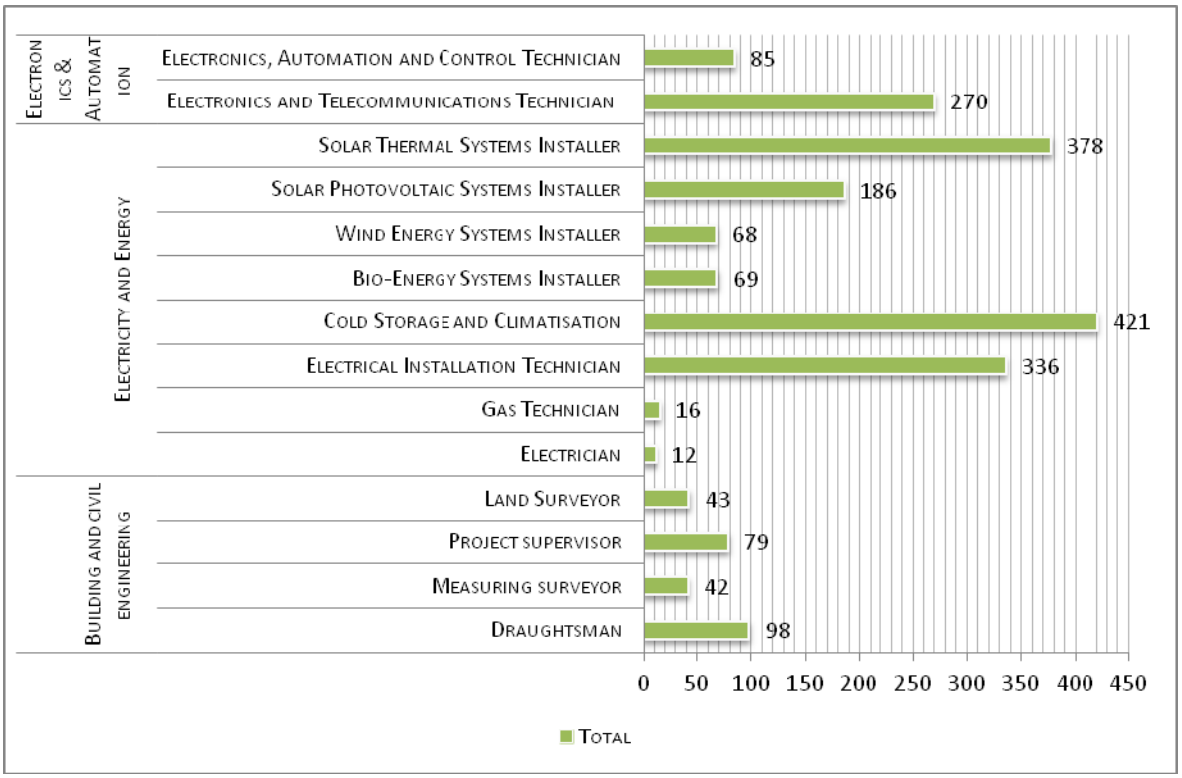


Figure 6.2 Student distribution by education & training area and apprenticeship courses

Regionally speaking this training offer has an asymmetrical distribution. In this context reference should be made to Northern Portugal, a region with offers found in no other region – electrician and gas technician – and delivering courses in all areas and qualifications identified.

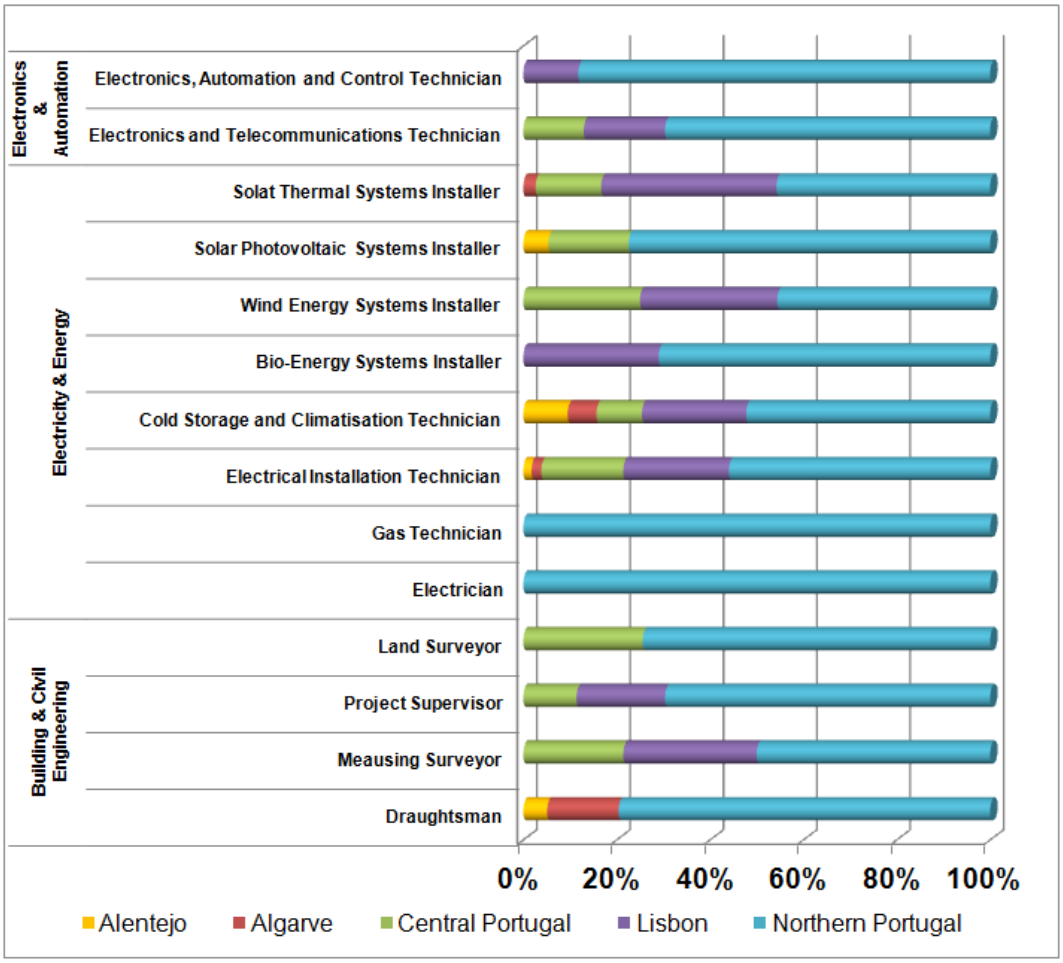


Figure 6.3. Distribution of apprenticeship courses by each NUT II region

6.1.4.2. VOCATIONAL COURSES – LEVEL 4 OF QUALIFICATION

These courses are delivered by vocational schools and secondary schools of the public and private network.

This work-linked modality aims to qualify young people to enter the labour market, combining theoretical training and technical training, with on-the-job training at entities of the activity sectors. In what concerns the targeted education & training areas, most students attend courses to obtain qualifications in the electricity & energy area, as regards both production and their use in connection with buildings' functionality – i.e. 71 percent, in particular within this group of courses related to renewable energies and electrical installations.

Special reference should be made to the course delivered to grant qualification as electronics, automation and control technician – outstanding not only vis-à-vis the entire set of vocational courses, but also regarding the number of students training for the same qualification in learning courses.

As observed in apprenticeship courses, the building & civil engineering area has the lowest number of students – even if we take into account the number of students attending courses for obtaining the qualification of built heritage recovery technician, which, for technical and scientific reasons, has been placed in the education & training area of History and Archaeology.

Table 6.10. – Training provided in 2011: Number of students registered in Vocational Courses, on the 31 December 2011.

EDUCATION AND TRAINING AREA	NUT II					TOTAL
	Alentejo	Algarve	Central Portugal	Lisbon	Northern Portugal	
BUILDING AND CIVIL ENGINEERING	10	33	350	173	226	792
Building civil engineering architectural technician	10	33	350	173	226	792
ELECTRICITY AND ENERGY	489	465	2324	1196	2595	7069
Naval Electricity Technician		18	13	48		79
Electrician	49		428	52	429	958
Renewable Energies Technician	240	269	1288	794	1459	4050
Cold Storage and Climatisation Technician	35	42	79	98	122	376
Gas Technician			34		8	42
Electrical Installation Technician	165	136	482	204	577	1564
ELECTRONICS AND AUTOMATION	151	20	440	580	794	1985
Electronics and Telecommunications Technician	13		127	265	118	523
Electronics, Automation and Control Technician	66	20	299	292	519	1196
Electronics, Automation and Instrumentation Technician	72		14	23	157	266
HISTORY AND ARCHAEOLOGY				25	49	74
Built Heritage Recovery Technician				25	49	74
TOTAL	650	518	3114	1974	3664	9920

Young people tend to choose training that enables them to obtain qualifications related with renewable energy sources, i.e. wind, solar photovoltaic, solar thermal and bio-energy (as stressed by Figure 6.4).

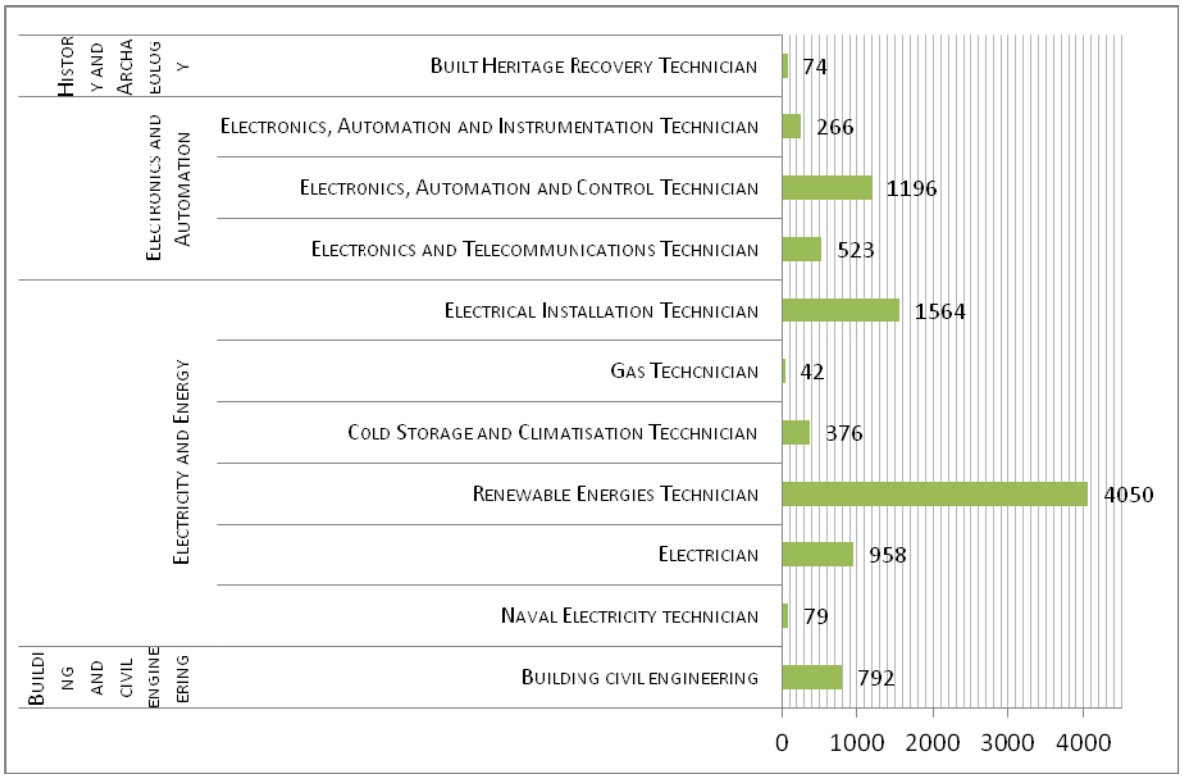


Figure 6.4. Student distribution by education & training area and by Vocational Course

Offer in this education & training modality – i.e. Vocational Courses – is better distributed among different regions (e.g. the course of electronics, automation and control). Nevertheless, as found in apprenticeship courses, some offers do not exist in all regions (e.g. gas technician, built heritage recovery technician).
Northern Portugal, although its offer does not include all courses available, is the region with the most widely diversified offer.

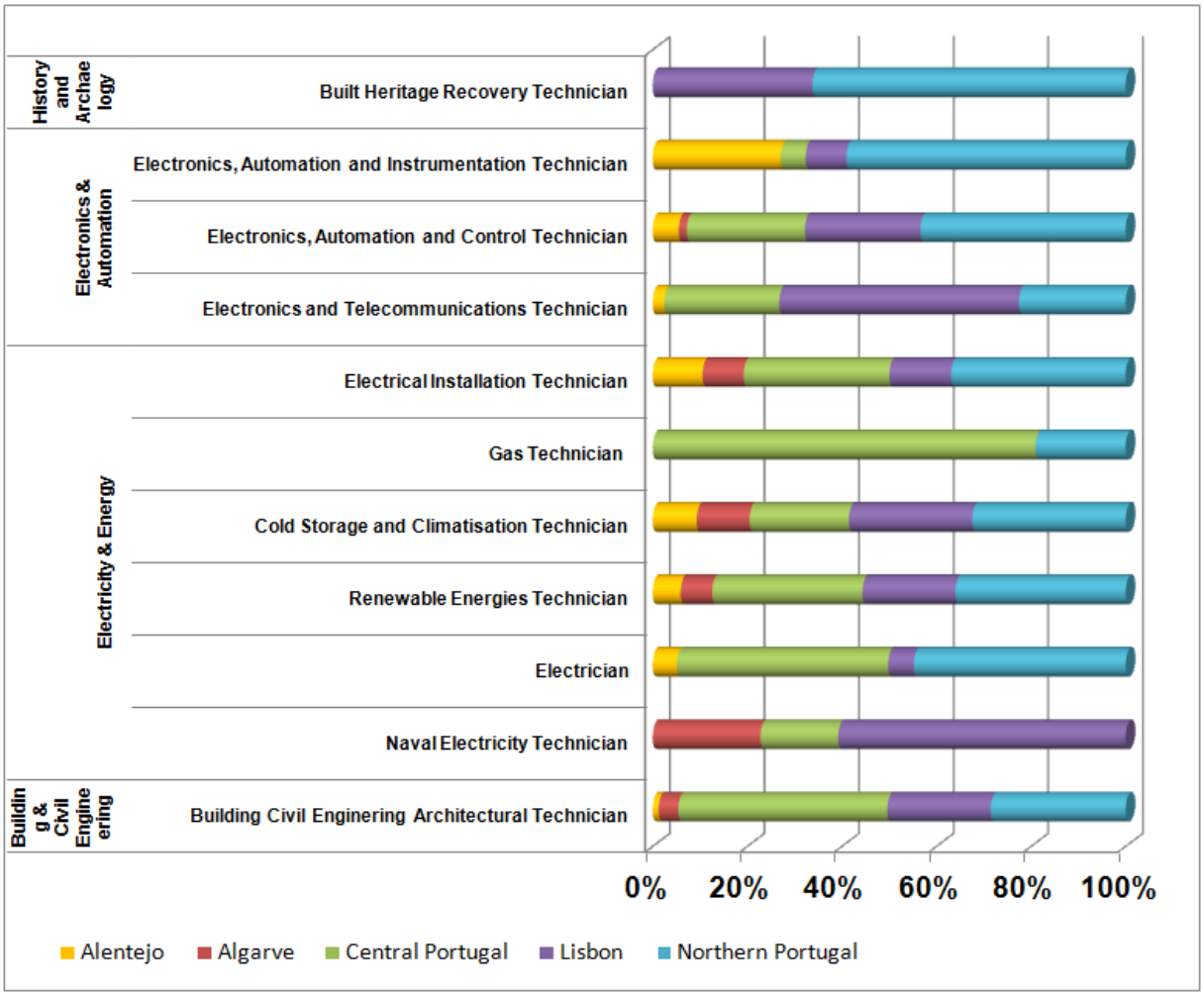


Figure 6.5 Distribution of Vocational Courses by NUT II region

6.1.4.3. EDUCATION & TRAINING COURSES FOR ADULTS – LEVEL 2 AND LEVEL 4 OF QUALIFICATION

These courses are delivered by vocational training centres, certified training entities, vocational schools and basic and secondary schools of the public and private network.

This education & training modality aims at qualifying adults for re-integrating active workers and improving their competences, combining theoretical and technical components in the context of on-the-job training at entities of the activity sectors. Data presented in this report show the 2010-to-2011 variations of both the training offer and number of attending students.

From 2010 to 2011 the number of students dropped by approximately 75 percent. Also the training offer in many education & training areas covered by this review decreased.

Level 2 qualifications, increased in number of students. Training however was provided only for one qualification – i.e. welder.

Over the same period no training was provided for qualifications at level 4 of the NQF, for land surveyors, electricians, installers of bio-energy systems and installers of wind energy systems.

Table 6.11 – Number of students registered in EFA courses (2010)

EDUCATION & TRAINING AREA EFA COURSES	NUT II					TOTAL
	Alentejo	Algarve	Central Portugal	Lisbon	Northern Portugal	
NQF LEVEL 2 QUALIFICATIONS	16		28	21		65
BUILDING AND CIVIL ENGINEERING			12			12
Mason			12			12
METALWORK AND MECHANICAL ENGINEERING	16		16	21		53
Constructional Ironwork Fitter-Machinist				21		37
Welder	16		16			16
NQF LEVEL 4 QUALIFICATIONS	210	36	502	501	879	2128
BUILDING AND CIVIL ENGINEERING	84	24	124	123	288	643
Building civil engineering architectural technician			15	34	118	167
Measuring Surveyor	18		13	35	35	101
Project Supervisor	66	24	58	54	114	316
Land Surveyor			38		21	59
ELECTRICITY AND ENERGY	112	12	367	364	506	1361
Electrician				21	20	41
Gas Technician			14	33		47
Electrical Installation Technician	36		80	29	98	243
Cold Storage and Climatisation Technician			30	104	53	187
Bio-energy Systems Installer		12			15	27
Wind Energy Systems Installer			21			21
Solar Photovoltaic Systems Installer	32		81	101	113	327
Solar Thermal Systems Installer	44		141	76	207	468
ELECTRONICS AND AUTOMATION	14		11	14	85	124
Electronics and Telecommunications Technician	14		11		70	84
Electronics, Automation and Control Technician				14	15	40
TOTAL	226	36	530	522	879	2193

Table 6.12 – Number of students registered in EFA courses (2011).

EDUCATION & TRAINING AREA EFA COURSES	NUT II Alentejo	Algarve	Central Portugal	Lisbon	Northern Portugal	TOTAL
NQF LEVEL 2 QUALIFICATIONS	19			34	19	72
METALWORK AND MECHANICAL ENGINEERING	19			34	19	72
Welder	19			34	19	72
NQF LEVEL 4 QUALIFICATIONS	73	36	162	181	56	508
BUILDING AND CIVIL ENGINEERING		16	45	70		131
Draughtsman			20	18		38
Measuring Surveyor				18		18
Project Supervisor		16	25	34		75
ELECTRICITY AND ENERGY	58	20	95	70	56	299
Gas technicians				18		18
Electrical installation technician	11	20		19	56	106
Cold storage and climatisation technician			31			31
Solar photovoltaic systems installer	31		31	33		95
Solar thermal systems installer	16		33			49
ELECTRONICS AND AUTOMATION	15		22	41		78
Electronics, automation and control technician	15		22	41		78
TOTAL	92	36	162	215	75	580

The graph below clearly shows that the number of students registered in training offers decreased from 2010 to 2011.

Reference should be made to the reduced number of students registered in courses for obtaining qualifications as solar thermal systems installers (roughly 89 percent), cold storage and climatisation technicians (roughly 83 percent) and measuring surveyors (roughly 80 percent).

It should be noted that the trend in adult qualification for cold storage and climatisation technician is opposed to that observed in training courses for young people.

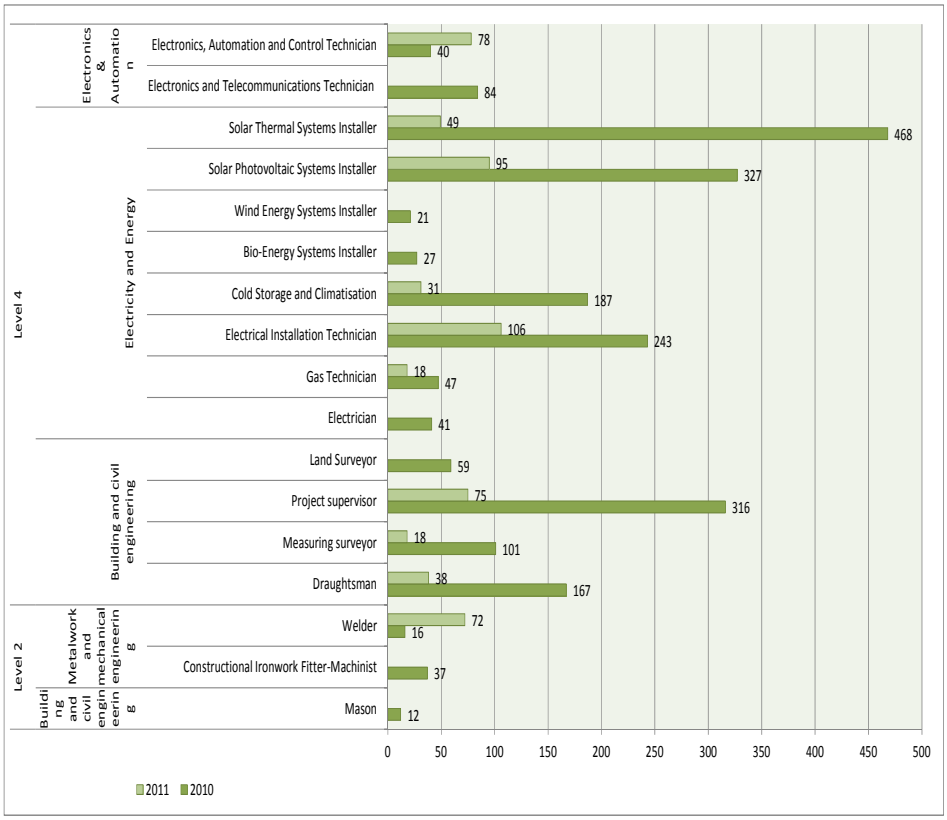


Figure 6.6 – Distribution of students by year, education & training area, EFA courses and level of qualification.

Graphs included below show data regarding training provided by way of EFA Courses:

- Concentration of courses in certain regions:

  2010 – Mason, welder and wind energy systems installer

  2011 – Gas technician, Cold storage and climatisation technician and measuring surveyor
- Regions with poor offer diversification:

  2010 – Algarve and Alentejo

  2011 – Algarve and Northern Portugal

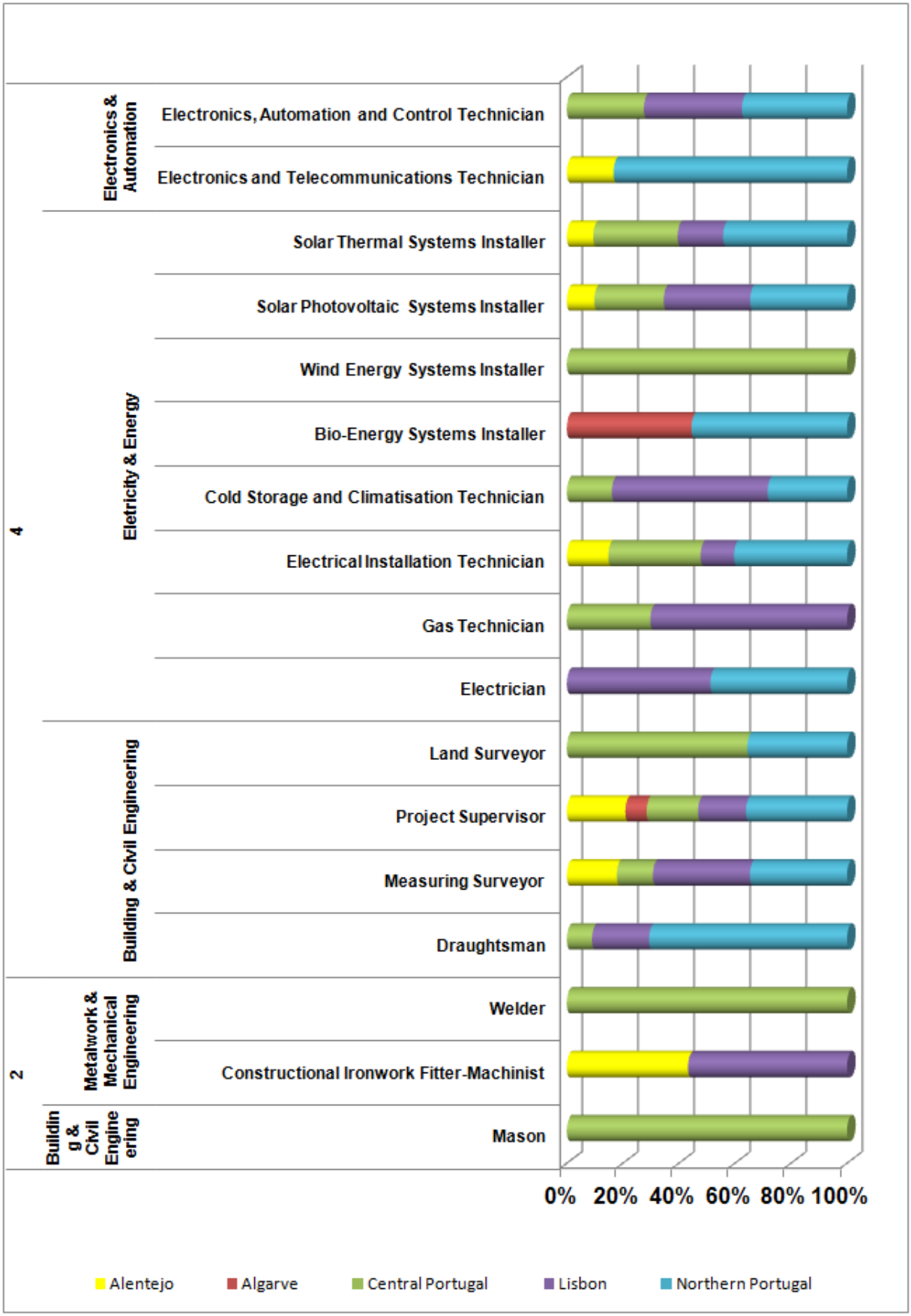


Figure 6.7 – Distribution of EFA Courses in 2010, by qualification level and NUT II region

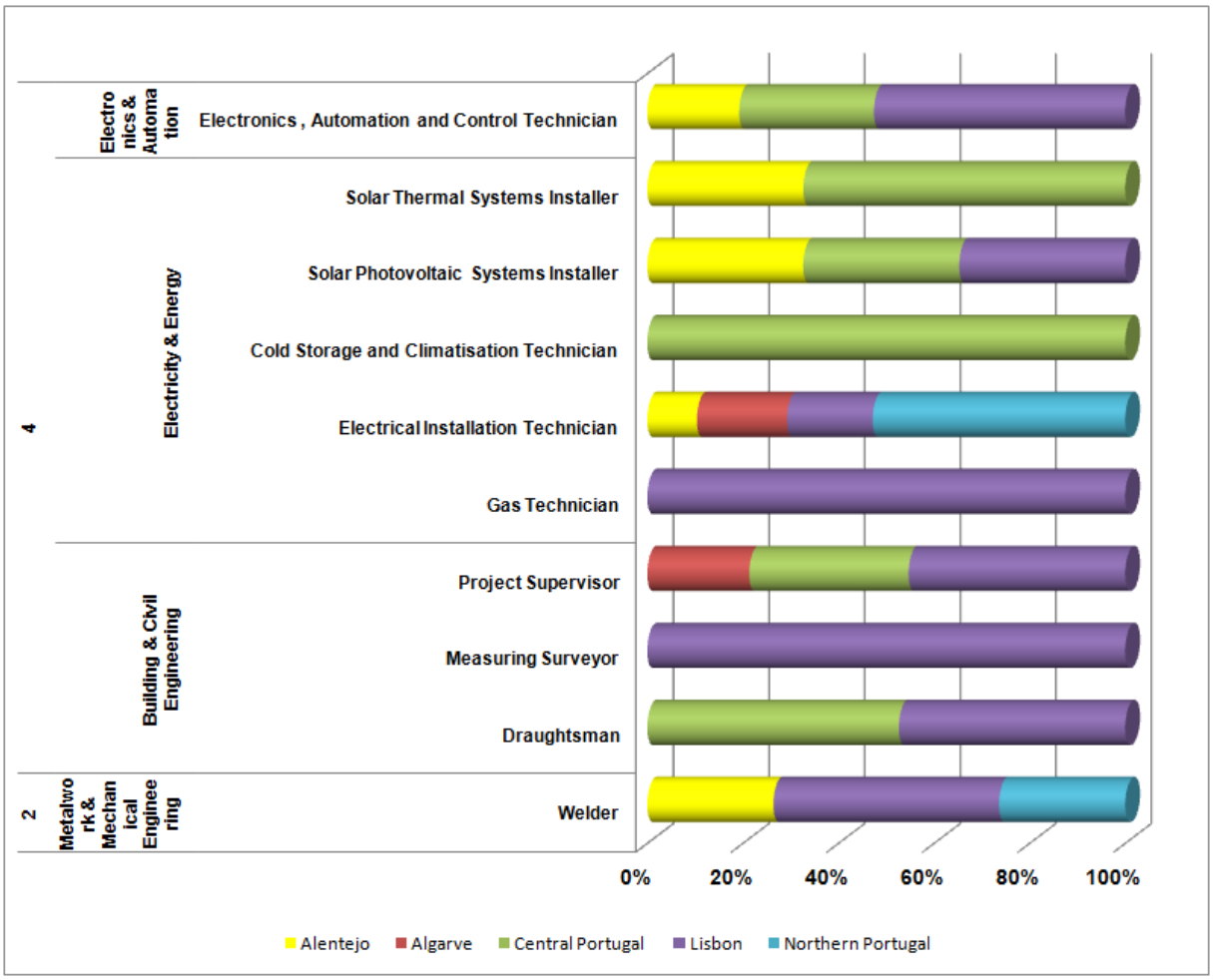


Figure 6.8 – Distribution of EFA Courses in 2011, by qualification level and NUT II region

6.1.5. Global evaluation

In short, the above data enabled us to underline the following features of the National Qualifications supply: (

- Regional asymmetries of the training offer, in terms of qualifications and education & training modalities;
- Investment in training actions associated with renewable energy sources, for the initial qualification of young people and adult qualification – in particular regarding installers of solar equipment, either photovoltaic or thermal;
- Sharp reduction in 2011 of the training offer targeted at adults, as regards the EFA education & training modality, in the framework of qualifications related with the building & energy sector.

In what concerns NQS/NQC Certified modular training for active workers, in the context of continuing training, as well as post-secondary non-university training (CET), the respective monitoring processes are currently under implementation.

6.2. Training courses on energy efficiency and renewable energy sources in buildings

The Directorate-General for Energy (DGEG), as certifying entity pursuant to Ordinance no. 1451/2004, of the 26 November, meanwhile revoked by Decree-Law no. 92/2011, of the 27 July, was given the power to issue CAP (Occupational Aptitude Certificate) and recognise training courses for installers of solar thermal systems. In this framework DGEG recognised 37 trainer entities responsible for the training of 10,135 installers of Solar Thermal Systems.

The above entities were requested to fill out a questionnaire regarding the training delivered in the energy sector. Answers obtained from 11 entities are reviewed as follows. It should be noted that part of the training identified in this regard may have already been included in our review of the NQS-incorporated training, specified in the previous section of this report.

In view of the wide variety of training actions, we divided them into gas, electricity, energy efficiency, solar thermal systems and HVAC systems actions. We only took stock of those taken in the period from 2005 to 2012.

Table 6.13 shows the distribution of training actions among the categories listed above.

Table 6.13 – Distribution of training actions.

TRAINING AREA	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING HOURS [HOURS]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]
Gas	282	271	4,945	26	96%
Electricity	750	693	48,545	59	92%
Solar Thermal	1,008	791	23,529	54	78%
HVAC	24	23	48	2	96%
Energy Efficiency	26	13	94	3	50%
TOTAL	2,090	1,791	77,161	144	86%

Source: DGEG

Next we review all training actions specific to each identified category. It should be noted that the training actions considered for this purpose may be initial training (long duration) or continuing training (short duration) and data concern training provided by only 11 companies.

6.2.1. Training for gas technicians:

Twenty-six training actions for gas technicians were delivered, attended by 282 trainees. Of these, 24 had a duration lower than 1000 hours and an attendance of 250 trainees, while 2 had a duration of more than 1,000 hours.

Table 6.14 – Training actions for gas technicians.

GAS	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]	DURATION BRACKET [HOURS]
Under 1000h	250	245	24	98%	From 8 to 225
Over 1000h	32	26	2	81%	From 2045 to 2080

Source: DGEG

6.2.2. Training actions for electricians:

In this category we included training actions for electricity specialists and solar photovoltaic systems installers.

Table 6.15 – Training actions for electricity specialists and solar photovoltaic systems installers.

ELECTRICITY	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]	DURATION BRACKET [HOURS]
Photovoltaic (under 1000h)	241	217	16	90%	From 32 to 175
Photovoltaic (over 1000h)	14	10	1	71%	2070
Electricity (under 1000h)	151	145	10	96%	From 25 to 100
Electricity (over 1000h)	344	321	32	93%	From 1060h to 3 years
Total under 1000h	392	362	26	92%	From 25 to 175
Total over 1000h	358	331	33	92%	From 1060h to 3 years
Ongoing training	87	Ongoing	5	Ongoing	From 2070h to 3 years

Source: DGEG

Fifty-nine electricity courses were organised with a 750-trainee attendance, their duration ranging from 25 hours to 3 years. Training in the electricity sector was divided into photovoltaic systems and electricity.

For each of these specialties, we processed the supplied data into training actions under 1000h and over 1000h.

6.2.3. Training for solar thermal technicians:

Fifty-four training actions were organised for solar thermal systems installers, with na attendance of 1,008 trainees. The number of hours of each training action ranged between 25 and 3291h.

Table 6.16 – Training actions for solar thermal systems installers.

SOLAR THERMAL	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]	DURATION BRACKET [HOURS]
Under 1000h	815	738	45	91%	From 25 to 125
Over 1000h	183	53	9	29%	From 1180 to 3291
Ongoing training	45	Ongoing	3	Ongoing	From 40h to 3 years

Source: DGEG

6.2.4. Training for HVAC technicians:

Three training actions for HVAC equipment installers were organised, with na attendance of 24 trainees and a 24h-duration.

Table 6.17 – Training actions for HVAC systems installers.

HVAC	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]	DURATION BRACKET [HOURS]
Under 1000h	24	23	2	96%	24h
Ongoing training	7	Ongoing	1	Ongoing	76h

Source: DGEG

6.2.5. Training for Energy Efficiency technicians:

Three courses were organised on the theme of Energy Efficiency, with an attendance of 26 trainees and a duration ranging from 16 to 370h.

Table 6.18 – Courses on Energy Efficiency.

ENERGY EFFICIENCY	TRAINEES [NO.]	SUCCESSFUL TRAINEES [NO.]	TRAINING ACTIONS [NO.]	SUCCESSFUL TRAINEES [%]	DURATION BRACKET [HOURS]
Under 1000h	26	13	3	50%	From 16 to 44
Ongoing training	7	Ongoing	3	Ongoing	From 350 to 370

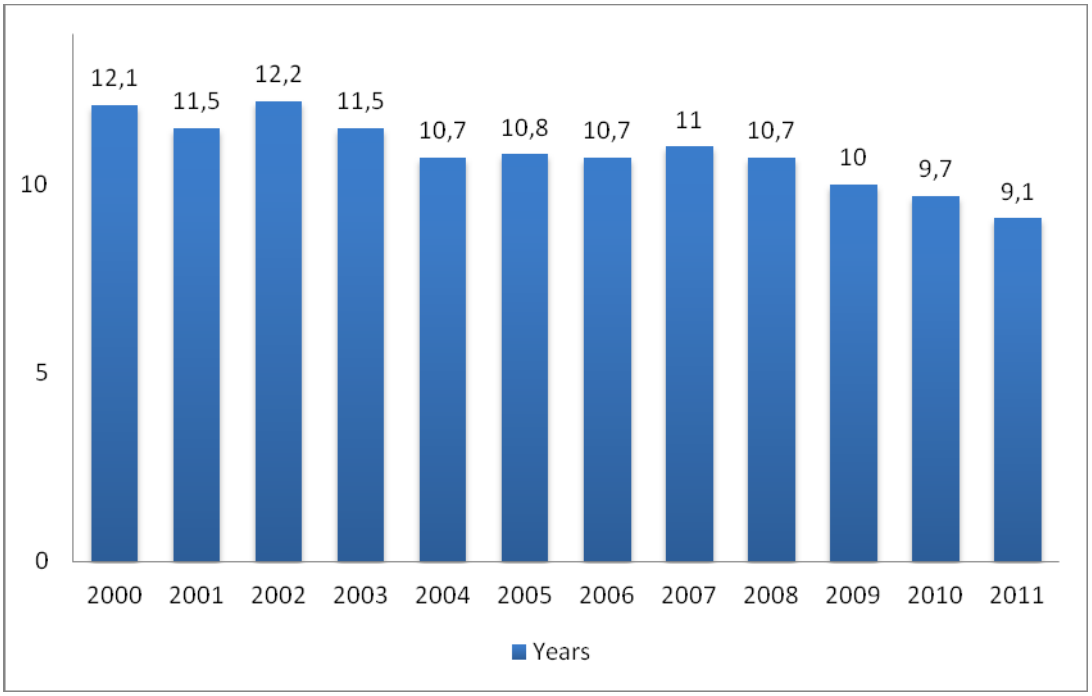
Source: DGEG

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

7.1. Labour force evolution

Employment growth in the construction sector has followed the trend of decline that occurs at national level, and in 2011 registered a decrease of 8.7% of the employed population, which corresponds to the loss of 42 100 workers from 2010 to 2011[37].

This decline is also reflected in the percentage of the population employed in the construction sector in the total employed population in Portugal, standing at 9.1% in 2011. In reality, this is a trend that has been following the evolution of employment in this sector in the last decade.



Source: Instituto Nacional de Estatística – Statistics Portugal, Employment Statistics - 4th Quarter 2011

Figure 7.1 Employment in construction in relation to total employment (%)

The fall in employment in the construction sector is accompanied by a significant increase in unemployment. The registered unemployed (looking for a new job), by economic activity, shows that in the construction sector the growth between 2009 and 2011 was 21%, standing at nearly 70 thousand subscribers, representing 14.4% of the national total[38].

The 5 types of occupations reporting the greatest number of applicants during the year 2011 include construction workers, as we can see from the following table.

[37] Source: Instituto Nacional de Estatística – Statistics Portugal, Employment Statistics - 4th Quarter 2011

[38] Overview of the employment market - Annual Report 2011, Institute of Employment and Vocational Training (IEFP)

Table 7.1 Occupations with the largest number of applicants (registered unemployment by occupation)

OCCUPATIONS WITH THE LARGEST NUMBER OF APPLICANTS	DEZ-10	DEZ-11	VAR.
5.1 Protection end security services workers	64537	72158	11,8%
9.1 Non qualified workers from services and commerce	65285	68203	4,5%
4.1 Office employees	54192	59976	10,7%
9.3 Non qualified workers in mining, construction and manufacturing	46646	50252	7,7%
7.1 Operators and related workers on mining and construction	44118	52110	18,1%

Source: Summary of the employment market - Annual Report 2011, Institute of Employment and Vocational Training (IEFP)

Although not part of the group of occupations with the highest registered unemployment, there are others occupations that develop their activity in construction and which had increased the number of applicants in the employment centres above the national average (which stood in 2011 10.9%):

Table7.2. Other occupations with high growth of unemployment

OCCUPATIONS WITH HIGH GROWTH OF UNEMPLOYMENT	DEZ-10	DEZ-11	VAR.
7.2 Workers in metallurgy, metalworking and similar	20361	23806	16,9%
3.1 Intermediate level technicians , physics, chemistry, engineering	17308	20851	20,5%

Source: Summary of the employment market - Annual Report 2011, Institute of Employment and Vocational Training (IEFP)

Complementing this analysis and as part of the adjustment between demand and job supply, we can see that the job offers received by the Institute of Employment and Vocational Training (IEFP) have decreased in all the following groups of occupations:

Table 7.3 Job offers received by occupation

JOB OFFERS	DEZ-10	DEZ-11	VAR.
3.1 Intermediate level technicians , physics, chemistry, engineering	3085	2447	-20,7%
7.1 Operators and related workers on mining and construction	8826	6440	-27,0%
7.2 Workers in metallurgy, metalworking and similar	7326	6299	-14,0%
9.3 Non qualified workers in mining, construction and manufacturing	14319	12261	-14,4%

Source: Summary of the employment market - Annual Report 2011, Institute of Employment and Vocational Training (IEFP)

More generally, we can also state that the job offers received in the construction sector fell by 31% from 2010 to 2011.

Another interesting indicator for the present analysis is the structure of placements of unemployment. Thus, as regards to the groups of occupations considered above and that are related to construction, we can see in the following table the structure of placements of unemployed in these occupations:

Table7.4. Structure of placements of unemployed by occupations

UNEMPLOYED PLACEMENTS	DEZ-10	DEZ-11	VAR.
3.1 Intermediate level technicians , physics, chemistry, engineering	1099	923	-16,0%
7.1 Operators and related workers on mining and construction	3913	3144	-19,7%
7.2 Workers in metallurgy, metalworking and similar	2944	2835	-3,7%
9.3 Non qualified workers in mining, construction and manufacturing	8648	8452	-2,3%

Source: Summary of the employment market - Annual Report 2011, Institute of Employment and Vocational Training (IEFP)

As we can observe, the numbers of placements in all the above categories of occupations have also decrease.

In summary, by increasing unemployment and reducing job offers, we can conclude that the mismatch between job demand and job supply have been increasing in the last years. This reinforces the importance and need for better and more qualified employment in the construction sector.

7.2. Skills needs

It is here reported the assessment made to the skill profiles related to the occupations[39], in the building sector with the key skills to improve energy efficiency and renewable energy integration in buildings.

The analysis was divided into five sub-areas according to the following classification:

- Electricity production from renewable energy sources;
- Thermal energy production from renewable energy sources;
- HVAC systems, boilers and other gas equipments;
- Other electrical equipments;
- Building construction.

Among the occupation skills and according to an expert panel, the skills which have a medium or high influence on energy efficiency and renewable energy integration in buildings (key skills) are presented in the following tables.

7.2.1. Electricity production from renewable energy sources

OCCUPATION	KEY SKILLS
Electrical mechanics and fitters which includes photovoltaic systems installer	- fitting, adjusting and repairing various kinds of electrical machinery and motors, generators, switchgear and control apparatus, instruments, or electrical parts of elevators and related equipment; - fitting, adjusting and repairing electrical parts in domestic appliances, industrial machines and other appliances; - inspecting and testing manufactured electrical products; - installing, testing, connecting, commissioning, maintaining and modifying electrical equipment, wiring and control systems; - designing, installing, maintaining, servicing and repairing electric and hydraulic passenger and freight lifts, escalators, moving walkways and other lift equipment; - connecting electrical systems to power supply; - replacing and repairing defective parts.

[39] Base group analysis according to ISCO classification and CPP 2010. It is noteworthy that the occupation skills analysis focused on the new classification (CPP2010), even if the previous occupation analysis was based on the classification of 1994 (CNP94) due to the lack of statistical data according to CPP2010 classification.

	Specifically for photovoltaic systems installer: - Know the requirements of the relevant regulations/ standards and safety conditions relating to practical installation, testing and commissioning activities for solar photovoltaic system installation; - Know the preparatory work required for solar photovoltaic system installation work namely how to interpret design documents and to identify equipment to install; - Know the layouts and the requirements for installing solar photovoltaic module arrays, namely the suitability of the proposed location and position of the PV modules for optimum collection capacity. - Plan and prepare for the installation of a new solar photovoltaic system. - Install solar photovoltaic system components. - Inspect and test a new solar photovoltaic system installation. - Commission a new solar photovoltaic system installation - Know the requirements for the routine inspection, service and maintenance of solar photovoltaic systems.
Building and related electricians	- installing, maintaining and repairing electrical wiring systems and related equipment in various buildings such as schools, hospitals, commercial establishments, residential buildings and other structures; - examining blueprints, wiring diagrams and specifications to determine sequences and methods of operation; - planning layout and installation of electrical wiring, equipment and fixtures, based on job specifications and relevant standards; - inspecting electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair; - selecting, cutting and connecting wire and cable to terminals and connectors; - measuring and laying out installation reference points; - positioning and installing electrical switchboards; - testing continuity of circuit.
Electrical engineering technicians	- designing and preparing blueprints of electrical installations and circuitry according to the specifications given; - preparing detailed estimates of quantities and costs of materials and labour required for manufacture and installation according to the specifications given; - monitoring technical aspects of the manufacture, installation, utilization, maintenance and repair of electrical systems and equipment to ensure satisfactory performance and compliance with specifications and regulations; - planning installation methods, checking completed installation for safety and controls or undertaking the initial running of the new electrical equipment or systems; - assembling, installing, testing, calibrating, modifying and repairing electrical equipment and installations to conform with regulations and safety requirements.

7.2.2. Thermal energy production from renewable energy sources

OCCUPATION	KEY SKILLS
Electrical mechanics and fitters which includes solar thermal installer and bioenergy installer	- fitting, adjusting and repairing various kinds of electrical machinery and motors, generators, switchgear and control apparatus, instruments, or electrical parts of elevators and related equipment; - fitting, adjusting and repairing electrical parts in domestic appliances, industrial machines and other appliances; - inspecting and testing manufactured electrical products; - installing, testing, connecting, commissioning, maintaining and modifying electrical equipment, wiring and control systems; - designing, installing, maintaining, servicing and repairing electric and hydraulic passenger and freight lifts, escalators, moving walkways and other lift equipment; - connecting electrical systems to power supply; - replacing and repairing defective parts. **Specifically for solar thermal installer:** - Know the requirements of the relevant regulations/ standards and safety conditions relating to practical installation, testing and commissioning activities for solar thermal systems installation - Know the preparatory work required for solar thermal systems installation work namely how to interpret design documents and to identify equipment to install - Know the layouts and the requirements for installing solar thermal systems, namely the suitability of the proposed location and position of the solar collectors for optimum collection efficiency - Plan and prepare for the installation of a new solar thermal system. Install solar thermal systems components. Inspect and test a new solar thermal system installation. - Commission a new solar thermal system installation - Know the requirements for the routine inspection, service and maintenance of solar thermal systems. - Know the health and safety risks and safe systems of work associated with solar thermal hot water system installation work and comply with respective security codes. **Specifically for bioenergy installer:** - Know the types of biomass appliance and their operating principles; - Know the requirements of the relevant regulations/ standards and safety conditions relating to practical installation, testing and commissioning activities of Biomass systems; - Know the preparatory work required for Biomass systems installations installation work namely how to interpret design documents and to identify equipment to install; - Know the layouts and the requirements for installing Biomass systems; - Plan and prepare for the installation of a new Biomass system; - Be able to install biomass appliances; - Be able to commission biomass appliances; - Know the requirements for the routine inspection, service and maintenance of biomass systems; - Know the health and safety risks and safe systems of work associated with biomass installations and comply with respective security codes.
Plumber and pipe fitters	- measuring, cutting, threading, bending, jointing, assembling, installing, maintaining and repairing pipes, fittings and fixtures of heating; - installing gas appliances and water heaters; - inspecting, examining and testing installed systems and pipes, using pressure gauge, hydrostatic testing, observation or other methods.

7.2.3. HVAC systems, boilers and other gas equipments

QUALIFICATION /PROFESSION	KEY SKILLS
Gas Technician (included in physical and engineering science technicians not elsewhere classified)	- collecting data and providing technical assistance regarding: efficient, safe and economic utilization of material and equipment; - aiding in the identification of potential hazards and introducing safety procedures and devices;
Plumber and pipe fitters	- measuring, cutting, threading, bending, jointing, assembling, installing, maintaining and repairing pipes, fittings and fixtures of heating; - installing gas appliances and water heaters; - inspecting, examining and testing installed systems and pipes, using pressure gauge, hydrostatic testing, observation or other methods.
Air conditioning and refrigeration mechanics	- Interpreting blueprints, drawings or other specifications; - assembling, installing and repairing components for air conditioning and refrigeration systems; - connecting piping and equipment by bolting, riveting, welding or brazing; - testing systems, diagnosing faults and performing routine maintenance or servicing.

7.2.4. Other electrical equipments

QUALIFICATION /PROFESSION	KEY SKILLS
Building and related electricians	- installing, maintaining and repairing electrical wiring systems and related equipment in various buildings such as schools, hospitals, commercial establishments, residential buildings and other structures; - examining blueprints, wiring diagrams and specifications to determine sequences and methods of operation; - planning layout and installation of electrical wiring, equipment and fixtures, based on job specifications and relevant standards; - inspecting electrical systems, equipment, and components to identify hazards, defects, and the need for adjustment or repair; - selecting, cutting and connecting wire and cable to terminals and connectors; - measuring and laying out installation reference points; - positioning and installing electrical switchboards; - testing continuity of circuit..
Electrical mechanics and fitters	- fitting, adjusting and repairing various kinds of electrical machinery and motors, generators, switchgear and control apparatus, instruments, or electrical parts of elevators and related equipment; - fitting, adjusting and repairing electrical parts in domestic appliances, industrial machines and other appliances; - inspecting and testing manufactured electrical products; - installing, testing, connecting, commissioning, maintaining and modifying electrical equipment, wiring and control systems; - designing, installing, maintaining, servicing and repairing electric and hydraulic passenger and freight lifts, escalators, moving walkways and other lift equipment; - connecting electrical systems to power supply; - replacing and repairing defective parts.

7.2.5. Building construction

OCCUPATION	KEY SKILLS
Bricklayers	- Laying stone, brick and similar building blocks to construct or repair walls, partitions, and other structures such as piers and abutments.
Carpenters and joiners	- Fitting, assembling and altering internal and external fixtures of buildings, such as walls, doors, door and window frames, facings and paneling.
Roofers	- Studying drawings, specifications and construction sites to determine materials required; - Covering roof frameworks with slate and pre-fabricated tiles to cover pitched roofs; - Laying a waterproof shield and fixing metallic or synthetic materials to a building's frame; - Sizing and cutting roofing materials to fit around edges corners and protuberances such as chimney.
Floor layers and tile setters	- Preparing floor areas for covering with a variety of materials; - Assembling carpet, tiles or other materials and laying them on floors according to design and other specifications; - Preparing wall areas for covering with tiles or other materials for decorative or other purposes such as acoustic insulation; - Setting tiles and constructing and laying mosaic panels to walls, floors and other surfaces.
Plasterers	- Applying one or more coats of plaster to interior walls and ceilings of buildings to produce finished surface; - Applying protective and decorative covering of cement, plaster and similar materials to exterior building surfaces.
Insulation workers	- Cutting insulation material by size and shape; - Applying slabs and sheets of insulating or sound-absorbing materials to walls, floors and ceilings of buildings; - Blow and pack insulating or sound-absorbing materials into cavities between walls, floors and ceilings of buildings with power-driven machines; - Examining plans, specifications and work sites to determine the type, quality and quantity of insulation material required; - Applying insulating materials to exposed surfaces of equipment such as boilers, pipes and tanks; - Insulating refrigeration and air-conditioning equipment.
Glaziers	- selecting the type of glass to be used, cutting to right size and shape and installing in windows and doors of buildings; - installing glass in skylights;
Construction supervisors	- reading specifications to determine construction requirements and planning procedures; - organizing and coordinating the material and human resources required to complete jobs; - examining and inspecting work progress; - supervising construction sites and coordinating work with other construction projects; - supervising the activities of building trades workers, labourers and other construction workers.

Draughtspersons	- preparing and revising working drawings from sketches and specifications prepared by engineers and designers for the construction, modification, maintenance and repair of buildings; - operating computer-aided design and drafting equipment to create, modify and generate hard-copy and digital representations of working drawings; - operating digitising table or similar equipment to transfer hard-copy representation of working drawings, maps and other curves to digital form; - preparing and revising illustrations for reference works, brochures and technical manuals dealing with the assembly, installation, operation, maintenance and repair of machinery and other equipment and goods; - preparing wiring diagrams, circuit board assembly diagrams, and layout drawings used for manufacture, installation, and repair of buildings; - arranging for completed drawings to be reproduced for use as working drawings.
Civil engineering technicians	- providing technical assistance connected with the construction of buildings and other structures, and with surveys or the preparation of survey reports; - ensuring compliance with design specifications, relevant legislation and regulations, and maintenance of desired standards of materials and work; - applying technical knowledge of building and civil engineering principles and practices in order to identify and solve problems arising; - assisting with the preparation of detailed estimates of quantities and costs of materials and labour required for projects, according to the specifications given; - organizing maintenance and repairs; - inspecting buildings and structures during and after construction to ensure that they comply with building, grading, zoning and safety laws and approved plans, specifications and standards, as well as with other rules concerning quality and safety of buildings.

7.3. Qualification needs

The next table crosses the occupations previously identified with the national available qualifications (National Qualification Framework levels 2 and 4) pointing out what skills upgrades are required.

OCCUPATION	QUALIFICATION(S)	LEVEL	SKILLS UPGRADE
Photovoltaic systems installer	Photovoltaic systems installer	4	Integration with wind systems installer to assign double qualification
NO[40]	Wind systems installer	4	Integration with photovoltaic systems installer to assign double qualification
Solar thermal installer	Solar thermal installer	4	Reinforcement of skills related to plumber occupation Integration with bioenergy installer to assign double qualification
Bioenergy installer	Bioenergy installer	4	Reinforcement of skills related to plumber occupation Integration with solar thermal installer to assign double qualification
Plumber	Plumber	2	Make possible an upgrade for solar thermal installer and bioenergy installer
Electrical engineering technicians	Electrical technician	4	Make possible an upgrade for wind and photovoltaic systems installer
NO[41]	Gas technician	4	Make possible an upgrade for solar thermal installer and bioenergy. Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.
Air conditioning and refrigeration mechanics	Cold Storage and Climatisation Technician	4	Make possible an upgrade for solar thermal installer and bioenergy.
	HVAC Systems Technician	4	Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.
Draughtspersons	HVAC Systems Designer		Make possible an upgrade for solar thermal installer and bioenergy.
Building and related electricians	Electrical Installation Electrician-Assembler	2	Make possible an upgrade for wind and photovoltaic systems installer.
Pipe fitter	NO		Energy efficiency related to mechanical ventilation

[40] Included in Electrical mechanics and fitters.
[41] Included in physical and engineering science technicians not elsewhere classified.

Bricklayers	Bricklayers	2	Applying thermal insulation and correcting thermal bridges
Carpenters and joiners	Trim carpenter	2	Windows installer other than wood frames
Roofers	NO		
Floor layers and tile setters	Floor layers and tile setters	2	Applying thermal insulation
Plasterers	NO		
Insulation workers	NO		
Glaziers	NO		
Construction supervisors	Construction supervisors	4	General approach of energy efficiency in construction
Draughtspersons	Draughtspersons	4	General approach of energy efficiency in construction
Civil engineering technicians	Building civil engineering architectural technician	5	General approach of energy efficiency in construction

Electrical renewable systems

The techniques of electricity are essential to the proper installation of wind and photovoltaic systems, which is a cornerstone for training installers of these technologies. Taken into account that electrical technicians have that skills, it could be possible to make available to undertake only specific short duration training units (UFCD) of installation of renewable power generation (wind and solar photovoltaic systems), in order to give them those qualifications.

Additionally, it could be offered the possibility of a double qualification on wind and photovoltaic systems installer by undertaking extra UFCD, complementing the base skills.

Thermal production from renewable energy systems

For the purposes of domestic hot water (DHW) and buildings space heating, solar thermal systems or boilers that use solid, liquid or gas biomass as fuel can be used. On the basis of these systems installation and maintenance are plumbing techniques, such as welding of pipes of various materials, as well as the connection of various equipments with the networks of hot and cold water and central heating of buildings. Taken into account that plumbers have that skills, it could be possible to make available to undertake only specific UFCD of installation of solar thermal and bioenergy, in order to give them those qualifications.

Additionally, it could be offered the possibility of a double qualification on solar thermal and bioenergy installer by undertaking extra UFCD, complementing the base skills.

HVAC systems, boilers and other gas equipments

Taking into account the main skills of the group of workers above referred, it could be possible to make available to undertake only specific UFCD with the reinforcement of skills/knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources.

Additionally, it could be offered the possibility of a double qualification on solar thermal and bioenergy installer by undertaking extra UFCD, complementing the base skills.

Other electrical equipments;

Taking into account that Electricians and Electrical Mechanics and Fitters have the above referred skills, it could be possible to make available to undertake only specific UFCD of installation of renewable power generation (wind and solar photovoltaic systems), in order to give them those qualifications.

Additionally, it could be offered the possibility of a double qualification on wind and photovoltaic systems installer by undertaking extra UFCD, complementing the base skills.

Building construction

Due to the fact that bricklayer skills are strongly related to the external envelope, an upgrade in the qualification is required in order to include thermal insulation applying techniques as well as thermal bridges correction.

A general upgrade on thermal insulation is required also for floor layers and tile setters qualification.

Moreover, currently carpenter skills only focus in wood materials. In relation to windows and doors installation, important elements for energy efficiency performance, there are two options:

1. Upgrade carpenter qualification to include specific skills on installation of other materials windows
2. Create a windows installer qualification.

In respect to construction supervisor, draughtspersons and civil engineering technicians, a general approach, common to other qualifications, should be introduced in the qualification skills, namely on thermal insulation, windows, rehabilitation techniques, new components, new façades elements, solar passive systems, shading devices.

It is noteworthy that there are key occupations that not have a corresponding qualification:

- Roofers
- Plasterers
- Insulation workers
- Glaziers
- Pipe fitter

Finally, there are two key qualifications that not explicitly have a corresponding occupation, but are included in other general occupation:

- Gas technician
- Wind systems installer

7.4. Monitoring needs

7.4.1. The principles for the quality of the National Qualifications System (NQS)

The achievement of the objectives of the NQS relies on the essential instrument of information and guidance for the qualification and for employment, as a contribution to increase the efficiency of the investment in education and training, meeting the expectations and needs of the individuals and of the enterprises.

The NQS is supported in an institutional model that integrates several entities and organisms, being quality a present objective in all the elements referred in point 6 of the present report.

In the scope of the information and quality of the system, the monitoring of the current and emerging needs of the enterprises and of the economical sectors is done concerning the evolution of the demands for skills required by the several professional activities, allowing to evaluate systematically the mismatches or gaps of the related qualities.

7.4.2 The monitoring and evaluation instruments

In what concerns the monitoring of the demands, both of the skills and of education and training, different contextualized and articulated instruments are used according to the different entities that in the scope of their competences operate in the monitoring processes.

SCOPE	STRUCTURES	ENTITIES
National	Integrated Management of the Qualification Systems Department	National Agency for Qualification and Vocational Education
	Sector Councils for Qualification	National Agency for Qualification and Vocational Education
	Studies and Evaluation Department	Institute of Employment and Vocational Training
	Centre of Labour Relations (Former Observatory of Employment and Vocational Training)	Ministry of Economy and Employment
	Strategic and Planning Cabinet	Ministry of Solidarity and Social Security
Regional	Commission of Coordination and Development of the North	Ministry of Agriculture, Sea. Environment and Spatial Planning
	Commission of Coordination and Development of the Centre	Ministry of Agriculture, Sea. Environment and Spatial Planning
	Commission of Coordination and Development of Lisbon and the Tagus Valley	Ministry of Agriculture, Sea. Environment and Spatial Planning
	Commission of Coordination and Development of Alentejo	Ministry of Agriculture, Sea. Environment and Spatial Planning
	Commission of Coordination and Development of the Algarve	Ministry of Agriculture, Sea. Environment and Spatial Planning
	Observatory of the Educational and Cultural System	Office of the Regional Secretary of Education and Culture of the Autonomous Region of Madeira
	Observatory of Employment and Vocational Training	Regional Directory of Labour, Vocational Qualifications and Consumer's Defense of the Autonomous Region of the Azores
Sectorial	ADENE Academy	ADENE – Agency for the Energy

7.4.3 The monitoring in the scope of the qualifications systems

Integrated Management of the Qualification Systems Department

It's an organic structure of the National Agency for Qualification and Vocational Education that aims at structuring a relevant training offer, adjusted to the needs of the enterprises and of the labour market based on the technical and technological evolution of the occupations and occupational profiles.

One of the main instruments to reach these aims is the National Catalogue of Qualifications, in whose definition and up-dating the Sector Councils for Qualification participate.

Sector Councils for Qualification

It's part of the competences of the Sector Councils for Qualification to analyse the existing qualifications, their evolution and the needs to update the qualifications, namely:

- Identify the developments in the different economic sectors of activity
- Identify qualifications and competences needs
- Present suggestions to update/develop the Catalogue
- Facilitate and support the processes of articulation/cooperation among relevant entities as far as qualifications are concerned in each sector of activity

The members of the Sector Councils for Qualification are experts appointed by the different sectors of activity, representatives of the social partners, enterprises of reference, training providers of the educational and training system and other accredited providers, as well as independent experts.

It´s these Councils competence to search, for the sector groups belonging to the Councils, the needs of training and to present possible solutions as a result of the studies, reports and other sources, namely institutional observatories, aiming the education and training areas defined in the Catalogue.

For each Council there is a mailbox to promote the communication and the cooperation among the representative entities of the labour market, the training providers and the competent bodies.

Associated to these structures, the Open Model of Consultation was created as an instrument of cooperation and articulation among the several entities, both at sector and institutional levels, which has the following objectives:

- support the updating of the National Catalogue of Qualifications, process led by the National Agency for Qualification and Vocational Education and by the Sector Councils for Qualification, by means of the formal intervention of other entities;

- formalize the participation and proposals of the entities, in order to meet the training needs as a result of the gaps and requirements identified in each occupation or occupational profile according to the labour market, respecting both the education and training areas and the occupations as defined, not only in specific regulation but also in sector-based documents.

In this context, the National Agency for Qualification and Vocational Education in articulation with the Sector Councils for Qualification and the other services responsible for the implementation of the policies regarding the education and vocational training, monitories the policies, namely, by gathering relevant information for their evaluation.

It is intended that some aspects will be analysed such as the identification of essential skills for competitiveness and modernization of the productive tissue. In order to achieve this purpose, deeper studies take place, namely, those that support the sectorial strategic plans and others specifically suggested, revealing issues such as:

- Characterization of the occupations by sectors according to the activities and the jobs
- Characterization of the levels of qualification of the workers and of the adjustment of the training to the required skills
- Expectations of the evolution per sector in terms of employment, qualification and training
- Suitable legislative framework

As explained in point 6 of the report, among the 16 Sector Councils for Qualification, there is the Sector Council for Building Construction and the one for Electricity and Energy.

7.4.4 The monitoring in the scope of employment and vocational training

Centre of Labour Relations

The Observatory of Employment and Vocational Training presently gave place to the Centre of Labour, consisting of four representatives of the ministry responsible for the labour area, a representative of each association of employers having a seat on the Permanent Committee for Social Dialogue, and two representatives of each of the associations of trade unions having a seat on the Permanent Committee for Social Dialogue, and, whose mission is to support the collective negotiation, as well as follow up the evolution of employment and of vocational training.

In the scope of its competences of following up the policies of employment and vocational training, it is responsible for:

- Helping in the diagnosis and prevention and problems related to employment and vocational training, namely, the ones related to mismatches between demand and offer, quality and dynamic of employment, qualifications, socio-professional integration and reintegration and training needs
- Monitoring the implementation of measures and programs in the scope of employment and of vocational training
- Semi-annually writing and publicizing reports on socio-economical information about employment market
- Cooperating at national and international level with public and private entities in actions and projects related to the object of the Centre of Labour

Commission of Coordination and Regional Development

The Commissions of Coordination and Regional Development are services belonging to the central administration, with administrative and financial autonomy, whose aim is to promote, in each region, the regional development and the strategic planning.

In this context, the Commissions of Coordination and Regional Development also promote observatories, whose objectives integrate the sector of employment and the definition of key sectors and their needs for the development in a regional and national perspective.

In the scope of the Commissions of Coordination and Regional Development, the Councils of Inter-sectorial Coordination were created with the objective of promoting and facilitating a coordination of the implementation of the policies of Public Central Administration at regional level, as well as promote the cooperation and the exchange of information among institutions.

Studies and Evaluation Department of the Institute of Employment and Vocational Training

It is an organic unit of the Institute of Employment and Vocational Training that, among other functions, analyses employment and unemployment. It articulates the unemployment regional and national data with the job demand data, using the following dimensions:

- Unemployed profile;
- The National Classification of Occupations, presently the Portuguese Classification of Occupations, more representative of the unemployed
- Satisfaction rate of the demand per occupation.

- The Studies and Evaluation Department every year publishes a Report on the status of the Labour Market.

Strategic and Planning Cabinet

The Strategic and Planning Cabinet is responsible for assuring the technical support to the definition of policies and to the strategic and operational planning in the scope of employment and aiming:

- The promotion, the research and the prospective studies that may help in the definition of strategies, policies, priorities and aims of the Ministry of Solidarity and Social Security.
- The monitoring and evaluation of the policies of the Ministry of Solidarity and Social Security.
- The production of suitable data for statistics studies in the scope of the Ministry of Solidarity and Social Security.

Accordingly, the Strategic and Planning Cabinet publishes studies, reports, as well as inquiries related with vocational training, specially with the gaps and the mismatches in certain occupations. The Inquiry aims at analyzing the vitality of the labour market, monitoring the labour demand changes and detecting the gaps and mismatches in the labour market.

7.4.5 The monitoring in the scope of employment and vocational training in the energy and building construction sectors

Among the activities and measures developed by the The Strategic and Planning Cabinet of the Ministry of Economy and Employment and by the Studies and Evaluation Department of the Institute of Employment and Vocational Training previously referred, data is produced based on studies and inquiries, with the purpose of monitoring the building construction and the energy sectors, as strategic sectors for the economy and the sustained development of Portugal.

As far as the energy sector is concerned the institution responsible for the monitoring is ADENE, which is an institution of public utility without profitable aims, belonging to the Ministry Of Economy and Employment with the participation of the General Directorate of Energy and Geology, of the General Directorate of the Economic Activities and the national Laboratory of Energy and Geology.

Its activities aim at rationalizing the energy behaviours, the implementation of new methods of energy management and the use of new technologies. In order to fulfil these objectives ADENE gets the support of public and private entities and specialized agent markets, with the purpose of reaching better levels of energetic efficiency and of finding answers to specific and suitable training needs, as to achieve impact in economy and in environment.

7.4.6 Strong and weak points in the monitoring process

The structures mentioned in this point, as they are organized and drawn, are suitable instruments for the identification of the mismatches and gaps of the qualifications in all the sectors of activity and especially in certain occupations and occupational activities.

The articulation among the entities responsible for the national system of qualifications, the competent bodies of the different sectors and the representatives of the sectors, of the occupations and of the occupational activities, has been becoming more and more regular, starting to really influence the definition of the training offers, allowing a more suitable definition of the training solutions in the scope of the National qualification system and the suitable answers to very specific needs of the different sectors of activity.

The interaction among several organisms belonging to different ministries and with very specific missions, very often working to reach the same objectives, demands a strong leadership able to effectively determine the different competences of the different entities in this detection of gaps and

mismatches in training, in order to allow a synergy of all the entities able to create more efficiency in the use of resources.

It´s difficult to adjust in time the training standards to the needs of labour skills, due to the constant technical and technological evolution, mainly in specialized occupations in the building construction and in the energy sectors, necessary to the competitiveness of the enterprises and to meet the demands of the legislative framework. This difficulty is due to the complex process of consultation, analysis and validation of the different social partners, experts and stakeholders in order to draw the training standards according to the labour needs.

It´s necessary to create a systematic model to identify the qualifications needs in each sector of activity.

8. Barriers

In the beginning of this report we mentioned that our working group made 4 surveys addressed to companies (Type I), entrepreneurial or industrial associations, trade unions and occupational associations (Type II), training entities (Type III) and others (Type IV), totalling 29 answers.

From our reading of the answers to the surveys to this stage of the Project, it has been possible to determine that, **from the point of view of companies**, there are two main barriers to training, i.e. absence of training offer adapted to corporate needs (3.7) and economic drivers (3.4).

In what concerns the **other Groups** that answered the questionnaire, economic drivers were the major constraint identified (4.1 and 4), followed by, in the case of entrepreneurial and occupational associations and trade unions, the time to be made available by companies (3.9) and, in the case of training entities, the absence of training offer (3.7).

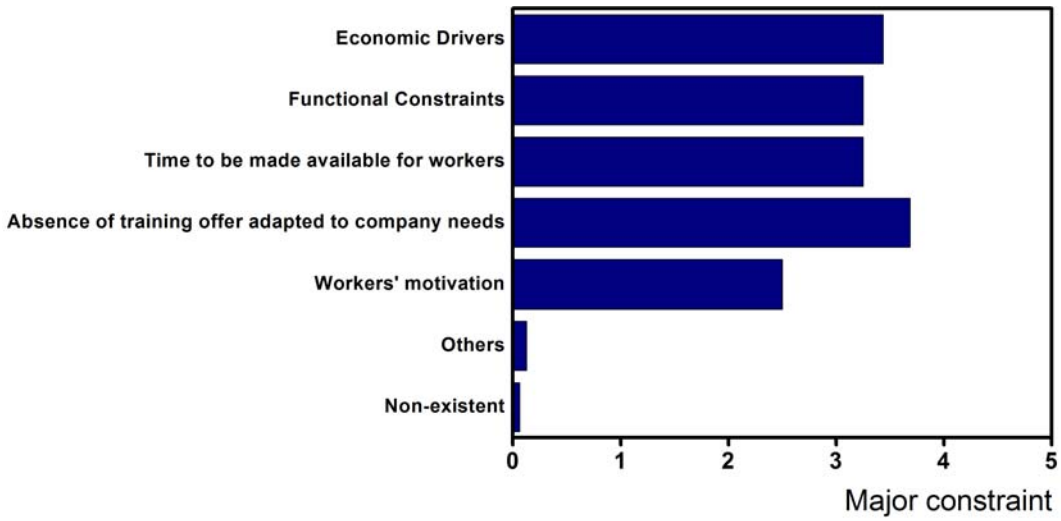


Figure 8.1 – Key constraints of companies with regard to workers' training.

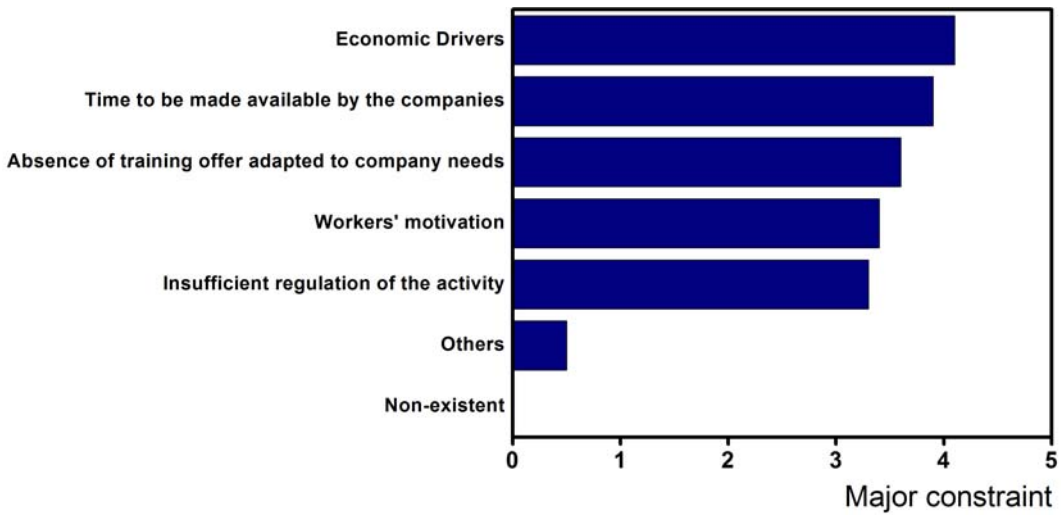


Figure 8.2 – Key constraints impeding the training of professionals in the building sector, from the point of view of occupational associations, trade unions, entrepreneurial & industrial associations and others.

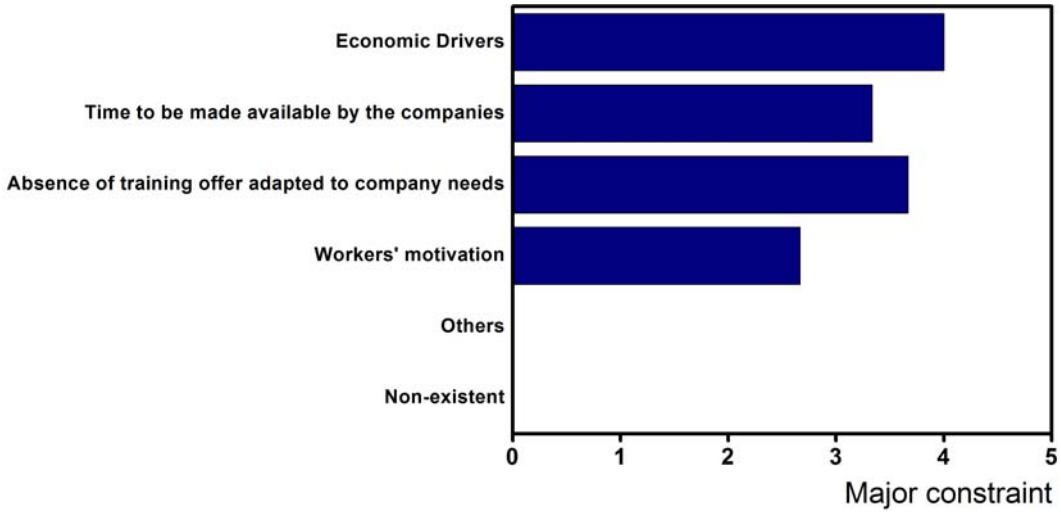


Figure 8.3 – Key constraints impeding the training of professionals in the building sector, from the point of view of training entities.

Among the questions not pre-defined in the surveys ("*other*"), we found some that showed scepticism with regard to the relevance and quality of the training offer:

- Training is not always profitable for companies, as investment in training is not always a driver of competition among companies;
- Training is generalist and has a poor quality;
- Quality of trainers needs improvement;
- Lack of practical applications;
- Poor relationship with the general public and little advertising given to themes;
- Little notion of the value attributed to comfort and savings;
- Existence of an unconscious waste-driven social culture.

Others, on the contrary, consider that training is indispensable to company competitiveness and modernity:

- Training is essential because technical competence is a key driver for companies;
- Training makes it possible to optimise working procedures and enable the use of more efficient and adequate equipment and materials;
- Training of professionals is essential to ensure the best use and application of available technology, not only for securing sufficient offer but also to warrant the credibility of systems itself;
- Training plays an extremely important role, as long as it matches all levels of intervention at each phase of a project.

We believe, in view of the relatively small number of respondents to the survey, that the issue of barriers impeding training and qualification is of the utmost importance and should be underlined on occasion of subsequent discussions with each different stakeholder. It deserves to be addressed not only to confirm pre-identified barriers and constraints, but also to identify others, and especially to agree upon improvement proposals.

Nevertheless, complementary to this analysis, and as a result of the thematic sessions with stakeholders developed until this moment, we can summarize other constraints, namely:

- The intermittence of effective policies to stimulate private investment in energy efficiency and renewable energy at the level of buildings, perceived trough the inconstancy of tax benefits and financial support;

- The requirements for employment, from the firms perspective, is mainly focused on technical training, which means that a large proportion of people doesn't have the adequate school-based training needed for a full competence base profile.
- Little reliability of existing data on the sector and expected evolution of the various parameters.

It was mentioned, as critical for the development of the qualifications of the work population, the uncertainty about the evolution of some social-economic and political factors:

- The evolution of the economic situation - need to establish scenarios.
- Public investment – need for quantification and typology.
- Evolution of work habits and consumption.
- Evolution of fuel prices and electricity.
- Options policies adopted for the sector and strategies for training / certification.
- Evolution / availability / accessibility of new technology solutions.
- Ageing parks housing and equipment - need review and improvement / replacement.
- Evolution of the maintenance needs of buildings and equipment - guaranteed or neglected by the users and owners
- Age pyramid of existing human resources (evolution and retirements).
- Weight of climate change.
- Raising awareness of the importance of control of Air Quality in its various aspects.

9. Conclusions

One goal of this report is to establish a set of well-structured systematic data enabling a broader sustained discussion with Portuguese stakeholders with a view to designing a national training roadmap capable of improving the skills of building-sector workers and installers in the fields of energy efficiency and renewable energies.

Having this in mind, the analysis of the building sector (including employment and national policies in the fields of energy, education and training) shows that this sector has clearly been affected by the existing economic crisis and its importance to Portuguese economy, in terms of its contribution to both GDP and GVA, has decreased over the last decade. This drop is also visible in terms of employment.

Notwithstanding the sector employs a majority of qualified workers – 74 percent qualified professionals, but with low educational levels (86 percent only finished primary school).

Investing in both the development of competences that help add value to the activities developed in the building and energy sector and in the professional requalification of part of the sector's workers are apparently two ways of responding to this sector's current difficulties of development and growth. Investing in the quality of services and products is a key bet to fulfil this goal.

In view of the response from the national qualification system, the survey made for this report made it possible to conclude the following:

- There is a widely diversified offer of initial training to both young people and adults.
- In what concerns training targeted at young people (i.e. Apprenticeship Courses and Vocational Courses), attendance is higher in courses providing qualifications in the fields of electricity and energy, regarding either their production or their use for the improved functionality of buildings – 71 percent, with particular emphasis, within this group, on courses promoting qualifications for electrical facilities, HVAC systems and the installation of solar thermal systems. In contrast the building sector civil engineering sector courses have the lowest number of students in attendance.
- In what concerns training actions targeted at adults (EFA Courses), some courses are more concentrated in certain regions – for example, the Mason, Welder and Wind-farming Energy Systems Installer courses held in Central Portugal in 2010, or the Gas Operator and Measuring Surveyor courses organised in Lisbon in 2011.
- The offer of adult training (EFA Courses) dropped significantly in 2011, as regards qualifications associated with the building and energy sector.

Indeed we can reach the following conclusions. On the one hand there are regional asymmetries regarding the offer of training, as to qualifications and the modalities of education and training. On the other hand investment has been higher in training actions concerning qualifications associated with renewable energies, as regards both the initial qualification of young people and adult qualification (particularly in connection with the installation of solar equipment, either photovoltaic or thermal).

As regards the continuing training of active workers, we found it a bit difficult to obtain systematic data – in terms of both certified training (monitoring process currently under implementation) and continuing training exclusively developed by companies and sector-specific certification schemes. In parallel we also considered that issues pertaining to the mechanisms for the certification of economic activities in the Building sector, which involve regulating the ability to develop professional activities, are not sufficiently explicit and developed in this Report. Therefore this subject-matter should be addressed at the next phase of this work, by making sure that all stakeholders participate in the identification and development of skills required for professionals in this sector.

Meanwhile, the skills gap analysis developed in this report showed that, among others, there are some improvements that could be made in the qualifications design and also on the training schemes needed to develop the competences required, namely:

- Reinforcement of skills/ knowledge related to the basic notions of energy, energy production/consumption, energy efficiency and renewable energy sources (Gas technician; HVAC Systems Technician)
- Integration of wind systems installer with photovoltaic systems installer to assign double qualification
- Integration of bioenergy installer with solar thermal installer to assign double qualification
- Make possible an upgrade for solar thermal installer and bioenergy installer
- Make possible an upgrade for wind and photovoltaic systems installer (Electrical technician; Electrical Installation; Electrician-Assembler)
- Make possible an upgrade for solar thermal installer and bioenergy (plumber; Cold Storage and Climatisation Technician; HVAC Systems Designer)
- Reinforcement of skills related to plumber occupation (bioenergy installer)
- Energy efficiency related to mechanical ventilation (pipe fitter)
- Applying thermal insulation and correcting thermal bridges (bricklayers)
- Applying thermal insulation (floor layers and tile setter)
- Windows installer other than wood frames (trim carpenter)
- General approach of energy efficiency in construction (Construction supervisors; Draughtspersons; Building civil engineering architectural technician)

In the framework of this study, following a survey made to a number of entities, we also identified the following key barriers that, by impeding the qualification of this sector's professionals, may put at jeopardy the fulfilment of goals associated with the 2020 strategy:

- Absence of training offer that matches the needs of companies;
- Economic drivers;
- Time to be made available by the companies.

In short, considering the ongoing shift of consumption behaviours regarding the use of different energy sources, due either to growing awareness as to the advantages and importance of such sources, or by virtue of international and national regulations in force, we need to take an in-depth reflection on the implications that such shifted consumption habits may have for the qualification of the sector's professionals.

At the next phase of this work we therefore need to make an in-depth analysis of which new skills are being required in certain fields of expertise of the building sector's occupational activities – namely those closely related with end-use energy, particularly in the framework of sector-specific certification schemes.

10. Authors/contributors

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12. Glossary

Employed Person (EP) – Individual who develops an activity under the authority and supervision of a third-party, pursuant to a labour agreement, written or unwritten, which gives him/her the right to compensation, regardless the results of the economic unit for which he/she works.

13. Appendix A

Back-up Table for Section 5.2 – Statistical Analysis of Employment

Table A1 – Employed Persons in the building sector, by occupation, according to the 2007-2009 variation

OCCUPATION - CNP	2007	2009	Overall Total (2007 a 2009)	% (2007 a 2009)
311205 - Building Engineering Technician	3.273	2.938	**9.437**	-10
311210 - Measuring Surveyor	755	805	**2.344**	7
311305 - Electrical Installation Technician	965	962	**2.951**	-0,3
311310 - Cold Storage & Climatisation Technician	713	747	**2.118**	5
311315 - Maintenance Man (electricity)	109	104	**330**	-5
311320 - Electrical Network Technician	42	29	**107**	-31
311805 - Chief Draughtsman	329	290	**965**	-12
311810 - Draughtsman	652	634	**1.981**	-3
712205 - Mason	51.970	41.408	**142.245**	-20
712210 - Refractory Bricklayer	359	519	**1.436**	45
712305 - Reinforcement Concreter	1.306	1.250	**3.898**	-4
712315 - Concrete Spreader Operator	45	35	**121**	-22
712320 - Masonry (prefab) Machine Operator	7	8	**18**	14
712325 - Masonry (prefab) Assembler	248	199	**759**	-20
712330 - Pre-Stressed Concrete Assembler	197	116	**449**	-41
712335 - Construction Supervisor	10.010	8.655	**28.087**	-14
712405 - Clean Carpenter	6.942	5.324	**18.424**	-23
712410 - Rough Carpenter	13.719	9.216	**34.313**	-33
713105 - Sheet Fitter-Assembler (fibre-cement)	21	30	**86**	43
713210 - Floor and Wall Tiler	1.824	1.416	**4.971**	-22
713215 - Parquetry worker	239	194	**679**	-19
713220 - Floor Layer	1.888	1.698	**5.531**	-10
713305 - Plasterer	4.275	3.594	**12.120**	-16
713405 - Insulator	928	960	**2.950**	3
713410 - Mastic Asphalter	597	548	**1.707**	-8
713505 - Glazier	127	121	**374**	-5
713605 - Plumber	6.092	5.596	**17.596**	-8
713610 - Pipe Fitter	379	405	**1.307**	7
714105 - Building Painter	8.078	7.455	**23.857**	-8
724115 - Electrical Mechanics of Lifts and Similar Equipment	980	1.253	**3.527**	28
724120 - Electrical Mechanics of HVAC Equipment	521	603	**1.695**	16
724135 - Electrician-Assembler of High Voltage Installations	246	206	**751**	-16
724140 - Electrician-Assembler of Low Voltage Installations	2.358	2.219	**6.952**	-6
724160 - Network Electrician (electrical energy distribution)	1.272	1.313	**3.976**	3
Overall Total	**121.466**	**100.850**	**338.062**	-17

Table A2 – Employed Persons in the building sector by occupation, in terms of region (NUT II), in 2009

OCCUPATION - CNP	11 - Northern Portugal	%	15 - Algarve	%	16 - Central Portugal	%	17 - Lisbon	%	18 - Alentejo	%	20 - Autonomous Region of the Azores	%	30 - Autonomous Region of Madeira	%	Overall Total	%
311205 - Building Engineering Technician	946	32%	269	9%	697	24%	684	23%	213	7%	32	1%	97	3%	**2.938**	3%
311210 - Measuring Surveyor	249	31%	37	5%	123	15%	308	38%	12	1%	67	8%	9	1%	**805**	1%
311305 - Electrical Installation Technician	320	33%	20	2%	130	14%	398	41%	73	8%	6	1%	15	2%	**962**	1%
311310 - Cold Storage & Climatisation Technician	183	24%	65	9%	114	15%	333	45%	24	3%	21	3%	7	1%	**747**	1%
311315 - Maintenance Man (electricity)	40	38%	0	0%	16	15%	44	42%	3	3%	1	1%	0	0%	**104**	0,1%
311320 - Electrical Network Technician	8	28%	2	7%	10	34%	8	28%	1	3%	0	0%	0	0%	**29**	0,03%
311805 - Chief Draughtsman	94	32%	10	3%	35	12%	126	43%	11	4%	5	2%	9	3%	**290**	0,3%
311810 - Draughtsman	256	40%	43	7%	77	12%	192	30%	16	3%	7	1%	43	7%	**634**	1%
712205 - Mason	12.690	31%	3.258	8%	12.237	30%	6.362	15%	3.456	8%	1.812	4%	1.593	4%	**41.408**	41%
712210 - Refractory Bricklayer	94	18%	0	0%	101	19%	324	62%	0	0%	0	0%	0	0%	**519**	1%
712305 - Reinforcement Concreter	706	56%	18	1%	467	37%	28	2%	19	2%	12	1%	0	0%	**1.250**	1%
712315 - Concrete Spreader Operator	17	49%	1	3%	8	23%	8	23%	0	0%	1	3%	0	0%	**35**	0,03%
712320 - Masonry (prefab) Machine Operator	2	25%	0	0%	2	25%	4	50%	0	0%	0	0%	0	0%	**8**	0,01%
712325 - Masonry (prefab) Assembler	60	30%	56	28%	29	15%	51	26%	2	1%	1	1%	0	0%	**199**	0,2%
712330 - Pre-Stressed Concrete Assembler	54	47%	1	1%	11	9%	49	42%	0	0%	1	1%	0	0%	**116**	0,1%
712335 - Construction Supervisor	3.226	37%	552	6%	1.814	21%	2.179	25%	317	4%	301	3%	266	3%	**8.655**	9%
712405 - Clean Carpenter	3.104	58%	243	5%	729	14%	708	13%	180	3%	187	4%	173	3%	**5.324**	5%
712410 - Rough Carpenter	5.528	60%	448	5%	948	10%	1.733	19%	289	3%	108	1%	162	2%	**9.216**	9%
713105 - Sheet Fitter-Assembler (fibre-cement)	13	43%	2	7%	4	13%	9	30%	0	0%	0	0%	2	7%	**30**	0,03%
713210 - Floor and Wall Tiler	242	17%	232	16%	444	31%	438	31%	29	2%	12	1%	19	1%	**1.416**	1%
713215 - Parquetry worker	133	69%	12	6%	31	16%	13	7%	5	3%	0	0%	0	0%	**194**	0,2%
713220 - Floor Layer	896	53%	24	1%	288	17%	455	27%	24	1%	0	0%	11	1%	**1.698**	2%
713305 - Plasterer	1.515	42%	266	7%	1.185	33%	438	12%	70	2%	13	0%	107	3%	**3.594**	4%
713405 - Insulator	323	34%	3	0,3%	189	20%	397	41%	47	5%	1	0%	0	0%	**960**	1%
713410 - Mastic Asphalter	212	39%	34	6%	116	21%	140	26%	16	3%	1	0%	29	5%	**548**	1%
713505 - Glazier	100	83%	0	0%	3	2%	18	15%	0	0%	0	0%	0	0%	**121**	0,1%
713605 - Plumber	2.506	45%	402	7%	1.068	19%	1.170	21%	144	3%	82	1%	224	4%	**5.596**	6%
713610 - Pipe Fitter	191	47%	26	6%	75	19%	99	24%	11	3%	0	0%	3	1%	**405**	0,4%
714105 - Building Painter	2.498	34%	549	7%	1.540	21%	1.818	24%	320	4%	282	4%	448	6%	**7.455**	7%
724115 - Electrical Mechanics of Lifts and Similar Equipment	329	26%	95	8%	131	10%	650	52%	14	1%	11	1%	23	2%	**1.253**	1%
724120 - Electrical Mechanics of HVAC Equipment	192	32%	43	7%	88	15%	230	38%	21	3%	1	0%	28	5%	**603**	1%
724135 - Electrician-Assembler of High Voltage Installations	99	48%	5	2%	30	15%	67	33%	4	2%	1	0%	0	0%	**206**	0,2%
724140 - Electrician-Assembler of Low Voltage Installations	877	40%	74	3%	491	22%	511	23%	116	5%	90	4%	60	3%	**2.219**	2%
724160 - Network Electrician (electrical energy distribution)	399	30%	53	4%	567	43%	207	16%	20	2%	65	5%	2	0%	**1.313**	1%
Overall Total	**38.102**	**38%**	**6.843**	**7%**	**23.798**	**24%**	**20.199**	**20%**	**5.457**	**5%**	**3.121**	**3%**	**3.330**	**3%**	**100.850**	**100%**

Table A3 – Employed persons in the building sector by economic activity, in terms of qualification level, in 2009.

CAE	Foremen, Supervisors, Masters and Team Leaders	%	Unknown	%	Prationers & Apprentices	%	Highly Qualified Professionals	%	Unskilled Professionals	%	Qualified Profissionals	%	Semi-Skilled Profissionals	%	Middle Managers	%	Senior Managers	%	Overall Total
41200 - Construction of residential and non-residential buildings	6.679	78%	911	50%	704	23%	1.656	63%	2.655	69%	52.903	71%	605	20%	2.412	80%	119	51%	**68.644**
43210 - Electrical installation	613	7%	155	8%	455	15%	326	12%	54	1%	2.701	4%	968	32%	112	4%	56	24%	**5.440**
43221 - Plumbing Installation	99	1%	166	9%	403	13%	81	3%	110	3%	2.987	4%	142	5%	64	2%	3	1%	**4.055**
43222 - Air conditioning installation	52	1%	55	3%	236	8%	212	8%	24	1%	1.142	2%	135	5%	46	2%	19	8%	**1.921**
43290 - Other construction installation	227	3%	120	7%	241	8%	106	4%	125	3%	2.036	3%	543	18%	39	1%	11	5%	**3.448**
43310 - Plastering	35	0,4%	24	1,3%	107	3,5%	20	0,8%	150	3,9%	1.560	2,1%	47	1,6%	26	0,9%	5	2,2%	**1.974**
43320 - Joinery installation	105	1%	73	4%	309	10%	33	1%	115	3%	2.399	3%	152	5%	58	2%	7	3%	**3.251**
43330 - Floor and wall covering	120	1%	49	3%	140	5%	30	1%	97	3%	1.818	2%	180	6%	43	1%	2	1%	**2.479**
43340 - Painting and glazing	131	2%	105	6%	245	8%	19	1%	162	4%	3.118	4%	92	3%	38	1%	5	2%	**3.915**
43390 - Other building completion and finishing	40	0,5%	39	2,1%	100	3,3%	24	0,9%	77	2,0%	1.229	1,6%	65	2,2%	22	0,7%	0	0%	**1.596**
43910 - Roofing activities	6	0,1%	0	0,0%	22	0,7%	3	0,1%	11	0,3%	61	0,1%	12	0,4%	5	0,2%	0	0,0%	**120**
43992 - Other miscellanous specialized construction activities	498	5,8%	129	7,1%	87	2,9%	139	5,2%	264	6,9%	2.679	3,6%	46	1,5%	160	5,3%	5	2,2%	**4.007**
Overall Total	**8.605**	9%	**1.826**	2%	**3.049**	3%	**2.649**	3%	**3.844**	4%	**74.633**	74%	**2.987**	3%	**3.025**	3%	**232**	0,2%	**100.850**

Table A4 – Employed Persons in the building sector by economic activity, according to their educational background

CAE	Bachelor's Degree	%	PhD	%	Basic Education	%	Post-Secondary non-University Level	%	Secondary Education	%	Unknown	%	Less than First Cycle of Basic Education	%	Graduation	%	Master's Degree	%	Overall Total	%
41200 - Construction of residential and non-residential buildings	415	71%	13	76%	59.481	69%	392	83%	3.709	53%	1.504	72%	2.015	83%	1.056	72%	59	61%	68.644	**68%**
43210 - Electrical installation	48	8%	1	6%	4.274	5%	13	3%	936	13%	28	1%	30	1%	103	7%	7	7%	5.440	**5%**
43221 - Plumbing installation	16	3%	0	0%	3.524	4%	8	2%	374	5%	45	2%	43	2%	44	3%	1	1%	4.055	**4%**
43222 - Air conditioning installation	14	2%	0	0%	1.415	2%	9	2%	402	6%	21	1%	7	0%	47	3%	6	6%	1.921	**2%**
43290 - Other construction installation	20	3%	2	12%	2.745	3%	5	1%	525	8%	65	3%	33	1%	46	3%	7	7%	3.448	**3%**
43310 - Plastering	0	0%	0	0%	1.766	2%	1	0%	97	1%	46	2%	58	2%	5	0%	1	1%	1.974	**2%**
43320 - Joinery installation	12	2%	0	0%	2.886	3%	12	3%	177	3%	91	4%	49	2%	24	2%		0%	3.251	**3%**
43330 - Floor and wall covering	11	2%	1	6%	2.236	3%	1	0%	147	2%	31	1%	23	1%	26	2%	3	3%	2.479	**2%**
43340 - Painting and glazing	5	1%	0	0%	3.438	4%	6	1%	257	4%	125	6%	69	3%	14	1%	1	1%	3.915	**4%**
43390 - Other building completion and finishing	9	2%	0	0%	1.424	2%	4	1%	85	1%	39	2%	22	1%	12	1%	1	1%	1.596	**2%**
43910 - Roofing activities	2	0%	0	0%	101	0%	0	0%	10	0%	1	0%	2	0%	1	0%	3	3%	120	**0%**
43992 - Other miscellaneous specialized construction activities	29	5%	0	0%	3.427	4%	21	4%	277	4%	87	4%	76	3%	82	6%	8	8%	4.007	**4%**
Overall Total	**581**	1%	**17**	0,02%	**86.717**	86%	**472**	0%	**6.996**	7%	**2.083**	2%	**2.427**	2%	**1.460**	1%	**97**	0,1%	**100.850**	**100%**

Table A5 – Employed Persons in the building sector by economic activity, according to their educational background and the 2007-2009 variation

	Bachelor's Degree			PhD			Basic Education			Post-Secondary non-University Level			Secondary Education			Unknown			Less than First Cycle of Basic Education			Graduation			Master's Degree		
CAE	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**	**2007**	**2009**	**%**
41200 - Construction of residential and non-residential buildings	479	415	-13	18	13	-28	74.212	59.481	-20	805	392	-51	4.192	3.709	-12	2.010	1.504	-25	2.600	2.015	-23	1.228	1.056	-14	101	59	-42
43210 - Electrical installation	70	48	-31	3	1	-67	4.761	4.274	-10	17	13	-24	889	936	5	48	28	-42	40	30	-25	80	103	29	12	7	-42
43221 - Plumbing installation	17	16	-6	1	0	-100	3.660	3.524	-4	7	8	14	371	374	1	39	45	15	59	43	-27	45	44	-2	4	1	-75
43222 - Air conditioning installation	19	14	-26	1	0	-100	1.520	1.415	-7	7	9	29	382	402	5	22	21	-5	9	7	-22	26	47	81	6	6	-
43290 - Other construction installation	21	20	-5	0	2	200	2.505	2.745	10	6	5	-17	432	525	22	88	65	-26	47	33	-30	36	46	28	3	7	133
43310 - Plastering	4	0	-100	0	0	-	2.152	1.766	-18	2	1	-50	95	97	2	59	46	-22	56	58	4	17	5	-71	1	1	-
43320 - Joinery installation	11	12	9	0	0	-	3.996	2.886	-28	6	12	100	234	177	-24	96	91	-5	124	49	-60	31	24	-23	2	0	-100
43330 - Floor and wall covering	8	11	38	1	1	-	2.415	2.236	-7	3	1	-67	154	147	-5	51	31	-39	44	23	-48	36	26	-28	1	3	200
43340 - Painting and glazing	8	5	-38	0	0	-	3.700	3.438	-7	18	6	-67	251	257	2	136	125	-8	95	69	-27	15	14	-7	0	1	100
43390 - Other building completion and finishing	18	9	-50	0	0	-	1.751	1.424	-19	7	4	-43	122	85	-30	41	39	-5	49	22	-55	15	12	-20	4	1	-75
43910 - Roofing activities	2	2	-	0	0	-	109	101	-7	1	0	-100	8	10	25	2	1	-50	2	2	-	4	1	-75	3	3	-
43992 - Other miscellaneous specialized construction activities	33	29	-12	0	0	-	3.911	3.427	-12	24	21	-13	328	277	-16	79	87	10	131	76	-42	96	82	-15	6	8	33
Overall Total	690	581	**-16**	24	17	**-41,2%**	104.692	86.717	**-17**	903	472	**-48**	7.458	6.996	**-6**	2.671	2.083	**-22**	3.256	2.427	**-25**	1.629	1.460	**-10**	143	97	**-0,5**

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.