Status Quo

Study on the Current Overview of the Construction Sector

July 2024

Madrid (Spain)

Cofinanciado por la Unión Europea. Los puntos de vista y las opiniones expresadas son únicamente los del autor o autores y no reflejan necesariamente los de la Unión Europea o CINEA. Ni la Unión Europea ni la autoridad competente pueden ser consideradas responsables de las mismas.

Document Data

NAME OF THE PROYECT	Construye 2030 | BUILD UP Skills. El sector de la construcción hacia 2030
ACRONYM	Construye 2030
CONTRACT NUMBER	101077607
PROJECT DURATION	November 2022 – July 2024
WORK PACKAGE	WP3. Statu Quo
DELIVERABLE	D3.2
REPORT PREPARATION	Project partners
DISSEMINATION LEVEL	Public
HOW TO CITE THE DOCUMENT	Fundación Laboral de la Construcción, "Status Quo. Study on the current state of the construction sector." (July 2024).
AVAILABLE AT	https://construye2030.fundacionlaboral.org/en/results/

VERSIÓN	FECHA	OBSERVACIONES
0	31/07/2023	First version of the report
1	31/07/2024	Update of the report

Index

Executive Summary

- By 2023, there are 1,361 million people employed in the construction sector, equivalent to 6.2 % of the total employed. This represents an increase of almost 200,000 people compared to 2012. In the current occupational structure of the sector, 62.6 % are skilled workers, followed by workers in elementary occupations (9.3 %) and technicians and support professionals (7.5%). The occupational structure of the sector in 2023 is very similar to that of 2011.

- The consumption of the residential sector in Spain was 14.4 Mtoe in 2020. This represents an increase of 2.3 Mtoe over the sector's consumption in 2020. Likewise, renewable energies covered 33.6 % of the energy demand of the residential sector in 2020. This is an increase compared to 2020, when only 22.1% of the sector's consumption was covered.

- The National Integrated Energy and Climate Plan 2021-2030 (PNIEC) sets targets for emission reductions, renewable energy use and energy efficiency improvements. The construction sector makes a significant contribution to the 2030 climate targets in Spain. Although its impact is difficult to calculate precisely because of its distribution over several general sectors, the PNIEC provides for 39% reduction in emissions in several sectors by 2030. An update of the PNIEC is expected by 2023.

- Between 27,122 and 30,821 architects, engineers and other university technicians (EQF Levels 6, 7 and 8) have additional training needs in Energy Efficiency (EE) and the use of Renewable Energy (RE). Alternatively, between 594,430 and 664,823 middle managers, construction skilled workers and installers (Levels EQF 3, 4 and 5) have additional training needs in EE and RE. This means that between 77,694 and 86,955 workers in the sector will need to be trained annually between 2023 and 2030. The need for additional workforce until 2030 is high and depends on the activation level of energy rehabilitations, as well as on the number of workers who will retire until then. Thus, at least 436,719 people employed in professions that are highly relevant to energy efficiency will be needed between 2024 and 2030.

The European Commission launched the ***BUILD UP Skills*** Initiative in 2011, with the aim of increasing the number of trained and qualified building professionals across Europe to conduct energy-efficient building renovations and new nearly zero-energy buildings. Construye 2030, which is financed by the LIFE Transition programme for clean energy, begins in November 2022 in the context of the initiative BUILD UP Skills, to promote the knowledge of the sector and respond to the needs for qualifying the construction sector's entire value chain in its transition towards a sustainable sector.

This **Study on the Current Overview of the Construction Sector in Spain** analyses the **current situation of the sector** and includes **the current and future training needs** to achieve the energy performance of buildings and contribute to meeting the **European Climate Goals of the 2030 Agenda**.

The findings of this report will feed into a Training Roadmap with measures to ensure that specific occupations in the sector are prepared to meet the energy challenges.

The European climate and energy targets are to reduce at least by 55 % Greenhouse Gas Emissions (from 1990 levels) and at least by 32 % the use of renewable energy, in addition to improving energy efficiency by at least 32.5 %.

To meet its European commitments, Spain has established, through Law 7/2021 on Climate Change and Energy Transition, a series of minimum national goals for 2030:

- 23 % reduction in greenhouse gas emissions compared to 1990.
- 42 % of renewables in energy end-use.
- 39.5 % improvement in energy efficiency.
- 74 % renewable energy in electricity generation.

To achieve this, the building sector plays a key role, as buildings account for 40 % of final energy consumption in the European Union, highlighting the need **to move towards a more sustainable and environmentally friendly model**.

At the national level, a number of policies and initiatives are being promoted to respond to and support this transition. The Recovery, Transformation and Resilience Plan is Spain's strategy for channelling Next Generation EU funds, which entails an unprecedented volume of investment and has a positive impact on the sector, such as an investment of 6,820 million euros in dwelling rehabilitation and urban regeneration or 6,667 million euros in the measures envisaged in the component dedicated to sustainable, safe and connected mobility (electric vehicle charging infrastructure).

All these policies and initiatives are underpinned by training and education legislation that supports young people's awareness of their natural and social environment and favours a VET system that offers new job opportunities in the framework of a **new production paradigm** that seeks to drive the transition to a sustainable, resilient and low greenhouse gas emitting economy.

Compared to the data collected in 2012 by the first Status Quo, activity in the sector has been increasing. Residential construction has shown an increase in the number of households and dwellings, although the construction of completed free dwellings has decreased significantly over the historical series as a whole. Non-residential construction has focused on commercial services, warehousing and tourism projects, with an increase in the percentage of rehabilitation licences compared to new construction.

In terms of energy efficiency, there has been a growth in the number of certificates issued for existing and new buildings, mainly in the residential sector. The construction sector is dominated by the sub-sectors of building construction and specialised activities, which account for the majority of companies, the vast majority being small and medium-sized enterprises (1 to 49 employees), constituting more than 99 % of the business fabric.

Regarding the workforce, the **most relevant** characteristics are:

- **By age:** there is a trend towards an ageing workforce. The majority age group is '55 and over'. Highlighting the percentage increase of workers 'aged 50-59' over the last eleven years (82.2 %) and the reduction in the number of young workers entering the sector.
- **By gender:** 21.8 % increase in the number of women in the sector since 2012, representing 8.8 % of the total number of employed persons in the sector.
- **By nationality:** construction is the sector with the highest proportion of foreign workers, accounting for 22.9 % of employed persons.
- **By level of education:** 52.56 % of those employed in the construction sector have a level of education of first stage of Secondary Education or lower, a figure that contrasts with a much smaller group (29.61 %) among those employed in all economic sectors.

Currently, it is estimated that around 42 % of people working in the construction and related sectors have a job related to energy efficiency or the use of renewable energies. This figure will increase annually by 10 % until 2030, according to the experts participating in the study.

Construction remains one of the least digitised sectors of the national economy, although progress is being made in the incorporation of technologies as a key element to increase competitiveness, energy efficiency and productivity, in response to workforce shortages.

Other characteristics that condition the productivity of the sector are: the rise in raw material and energy prices, the decrease in public investment in the decade 2010-2020, the reduction in immigration and the existence of an underground economy.

In terms of energy sources for the gross available energy, oil is predominant. Between 2000 and 2020 there is a decrease in the use of oil and coal, and an increase in the use of natural gas and renewable sources. In terms of energy consumption by sector, the residential sector was the third most energy-consuming sector at the national level. According to the structure of residential energy consumption, the main contributor is heating.

The European Climate and Energy Goals pose a number of qualification challenges for construction workers. As part of the **Renovation Wave** to be implemented in Spain by 2030, it is expected that **between 33,000 and 88,000 new jobs will be generated**, which entails a need to train and update the skills of workers in new construction systems, technologies, the introduction of energy efficiency in design or the adaptation of buildings to new climatic conditions.

Throughout this Study, **the analysis of agents, representative voices of the sector, from different profiles and fields of work (educational, political, administrative, social and environmental)** on the educational offer of VET and university/master's degrees related to renewable energies, energy efficiency, digital technologies and construction with sustainability criteria, in general, is collected. Including the barriers (resource, administrative, sector-specific, educational or structural) that condition sectoral training.

In Spain, around 10.5 million people do not have a professional qualification or formal accreditation of their professional skills. It is important to note that the construction sector has traditionally been a professional gild sector, where workers learned on site from more experienced professionals in the trade. The professional profiles that design and manage construction projects are regulated by the Building Standards Law (*Ley de Ordenación de la Edificación*), which requires university degrees (architect, technical architect, engineer, technical engineer) for these positions. However, construction execution jobs (foremen, installers and other professionals) are not subject to the obligation to hold a specific qualification, with a few exceptions, such as gas fitters, for example, for whom a professional licence is required.

While the number of students enrolled in basic, intermediate and higher vocational training is increasing, the number of graduates in vocational training degrees related to sustainability and energy performance of buildings is decreasing.

Regarding the training offer on energy efficiency and the use of renewable energies in the VET and university/master's degree system, the experts agree that it is not appropriate (it is dispersed and, on occasions, too generic), although they value more positively the training offered by the VET system, considering that a greater practical focus is necessary.

With regard to sectoral training, it is perceived that the training offer needs a higher level of alignment to specific jobs, as well as a greater weight of the practical part.

The Study has assessed, in detail, the linkage and importance of the different professional profiles involved in a project in relation to energy efficiency and renewable energies. A stronger linkage can be seen in those related to the installation of thermal insulation of buildings, renewable energy production, heat pumps and aerothermal energy, and photovoltaic cells. The document lists a series of potential professional profiles relevant to achieving these Objectives.

As part of the **barriers that condition the training of the sector's workforce** in energy efficiency and renewable energies, the experts highlight: the interference of these courses with the execution deadlines of the companies in the sector (mostly SMEs); the lack of skills of the teachers themselves in this field, it being necessary to define the skills required to teach in this area; or the low demand for training both by young people who are not interested in the sector and by workers and companies, among others.

Based on these barriers and conditioning factors of the sector, the document includes a series of strategies to solve the workforce shortage that responds to the demand for sustainable construction, such as: modernising the image of the sector, giving value to the different occupations and trades, promoting specialised training, accrediting professional skills through experience, offering guidance and financing for long-term itineraries, promoting more specialised and multidisciplinary training, facilitating immediate incorporation into the labour market, expanding construction techniques and giving value to the innovative and technological nature of the sector.

ACRONYMS

CEAP: Circular Economy Action Plan

CGATE: General Council of Technical Architecture of Spain

COAM: Official College of Architects of Madrid

CTE: Technical Building Code

CTI: Complementary Technical Instruction

DHW: Domestic Hot Water

ENA: Energy and Water

EQAVET: European Quality Assurance Reference Framework for Vocational Education and Training

EQF: European Qualifications Framework

EOC: Building and Civil Works

ERESEE: Long-Term Strategy for Energy Renovation of the Building Sector in Spain

EU: European Union

FEMP: Spanish Federation of Municipalities and Provinces

FNEE: Spanish National Energy Efficiency Fund

GHG: Greenhouse Gas Emissions

IDAE: Institute for the Diversification and Saving of Energy

IMA: Installation and Maintenance

INCUAL: National Institute for Vocational Qualifications

INE: Spanish National Institute of Statistics

LOE: Law on the Regulation of Building

MEFP: Ministry of Education and Vocational Education and Training

MIVAU: Ministry of Housing and Urban Agenda

MITES: Ministry of Labor and Social Security

NEEAP: National Energy Efficiency Action Plan

NCOE: National Catalogue of Occupational Skills

NCPQ: National Catalogue of Professional Qualifications

NSQVET: National System of Qualifications and Vocational Education and Training

NZEB: Nearly Zero Energy Building

PERTE: Strategic Project for Economic Recovery and Transformation

PNACC: National Adaptation Plan for Climate Change

PNIEC: National Integrated Energy and Climate Plan

RES: Renewable Energies

RITE: Regulation on Thermal Installations in Buildings

SEPE: Spanish Public Employment Service

SJC: Sectoral Joint Committees

SM: Square Meter

SNCFP: National System of Qualifications and Vocational Training

TOE: Tonnes of Oil Equivalent

VET: Vocational Education and Training

1. Introduction

2030 energy and Climate Goals

The European Commission, in its aim to address climate change, published in 2019 the European Green Deal, which sets out a strategy for growth through a green transition of productive sectors and sustainable finance.

In this framework, it is the European Climate Law (2021), which sets a binding target for the European Union to reduce net greenhouse gas emissions by at least 55 % by 2030 compared to 1990 levels.

In the context of construction, the Renovation Wave is launched in 2020 to contribute to emission reductions by sector. Still under development, this initiative aims to double annual renovation rates by 2030 and thus achieve lower energy consumption of buildings, improve the quality of life of people living in buildings, and create green jobs. According to the working documents of the same Renovation Wave, more than 220 million buildings in the European Union were constructed before 2001 and 85-95 % of existing buildings will still be standing in 2050.

The Renovation Wave sets out seven areas of action:

- Strengthening information, legal certainty and incentives for public and private landlords and tenants to undertake renovations.
- Ensuring adequate and well-targeted funding.
- Increasing capacity to develop and implement projects.
- Promoting comprehensive and integrated renovation interventions for smart buildings and the integration of renewable energies and enabling the measurement of actual energy consumption.
- Adapting the building ecosystem for sustainable renovations, based on circular solutions, the use and reuse of sustainable materials and the integration of natural solutions.
- Using rehabilitation as a stimulus to address fuel poverty and access to healthy dwelling for all households, including people with disabilities and older people.
- Promoting the decarbonisation of heating and cooling systems, which are responsible for 80% of the energy consumed in residential buildings.

2030 energy and climate targets in Spain

The set of National policies and strategies aimed at achieving the 2030 Goals in the building sector in Spain is extensive. The updated National Integrated Energy and Climate Plan (PNIEC), sets new targets for emission reductions, renewable energy use and energy efficiency improvements. Specifically, it calls for an overall reduction in emissions of 23 % below 1990 levels by 2030.

In this respect, the national regulations that are mandatory for the sector are being reviewed. Thus, the Código Técnico de la Edificación (technical building code) (CTE) and the Regulation on Thermal Installations in Buildings (RITE) have already been updated and the basic procedure for the Energy Efficiency Certification, to promote energy savings and efficiency in buildings, is in the process of being updated.

The Pact for Skills

This transition to an emission-neutral economy is a challenge that requires a training effort. In this sense, the European Commission **European Pact for Skills**, which is aimed at supporting public and private organisations to improve and acquire now skills in order for the workers to be able to promote through a double transition, green and digital.

The **Pact for Skills in the Construction sector** was signed on 8 February 2022 by the European social partners in the construction sector, FIEC (European Construction Industry Federation) and EFBWW (European Federation of Building and Woodworkers), in cooperation with EBC (European Builders Confederation). This agreement aims to upskill and reskill at least 25 % of the EU construction workforce (3 million workers) between 2022 and 2027, by building strong partnerships, monitoring occupational supply/demand and anticipating knowledge and skills needs.

The year 2023 was precisely designated as the **European Year of Skills,** in which extraordinary resources have been earmarked to promote and improve citizens' skills across Europe, in particular in aspects related to the twin ecological and digital transition.

The BUILD UP Skills initiative and its contribution to the construction sector in the field of qualifications

BUILD UP Skills is an initiative that was launched in 2011 by the European Commission with the objective of increasing the number of professionals in the construction sector trained and qualified in Europe in order to renovate the real estate sector, providing a high energy performance and building new buildings with nearly zero energy consumption. BUILD UP Skills has been integrated in three different European programmes, which have co-funded numerous projects for more than a decade.

Figure 1. Trayectory of the *BUILD UP Skills* initiative through the different european programmes. Source: translation of information provided by CINEA.

The first programme to host the initiative was **Intelligent Energy Europe**. During the first stage (2011-2012), the objective was to bring together energy, training and construction professionals to set up National Qualification Platforms, to map the characteristics of the sector's workforce and available training, identifying future training needs of the sector towards 2020. 30 countries participated and compiled this information in a report (Status Quo) on the basis of which Roadmaps were designed that formulated measures to overcome the skill gaps identified at the national level. During the second phase (2013-2016), the objective was to design and pilot the priority actions set out in the Roadmaps of the previous initiative. This time, 22 European countries took part.

The **Horizon 2020** programme integrated the initiative from 2014 to 2020, co-funding a total of 25 European consortia that developed proposals to boost the demand for qualified professionals through the recognition of skills and qualifications; in addition to carrying out particularly relevant actions to disseminate the benefits of energy efficiency among citizens.

Finally, BUILD UP Skills is currently part of the **LIFE** programme, and is looking for an update on the results of the first outcomes of the initiative: Status Quo, Roadmap and re-launch of National Platforms.

Since the launch of BUILD UP Skills, the **Fundación Laboral de la Construcción** has led the initiative in the national projects during the three European programmes: BUILD UP Skills, Pillar I (2011-2012) and Construye 2020 (2013-2016) in the Intelligent Energy Europe programme; Construye+ (2018-2021) in the Horizon programme; and Construye 2030 (2022-2024) in the LIFE programme.

Figure 2. Trajectory of the BUILD-UP Skills initiative led in Spain by Fundación Laboral de la Construcción. Source: own elaboration.

All these projects have relied on **robust partnerships** from the technical field of construction and training in the construction sector. Fundación Laboral de la Construcción (FLC), Instituto de Ciencias de la Construcción Eduardo Torroja, which is part of the Higher Council of Scientific Research (IETcc-CSIC), Instituto Nacional de Cualificaciones (INCUAL) and Fundación Estatal para la Formación en el Empleo (FUNDAE) collaborate from this first stage of the initiative. At Construye 2030, the social spokespeople of the construction sector have joined the consortium (Confederación Nacional de la Construcción (CNC), Comisiones Obreras del Hábitat (CCOO-Habitat) and Federación de Industria, Construcción y Agro de la Unión General de Trabajadoras y Trabajadores (UGT-FICA), y Green Building Council España (GBCe).

Figure 3. Member entities of the Construye 2030 consortium. Source: own elaboration.

This Status Quo is part of the Construye 2030 project. Its main objective is, therefore, to identify in Spain, which skills are needed by the professional profiles of the whole value chain of the sector to be able to renovate their buildings and achieve high energy performance in them, as well as to be able to construct new buildings with nearly zero energy consumption.

The Status Quo is an update of the one already conducted in 2011-2012, and its importance lies in the transformations that have affected the sector following regulatory changes, COVID-19 and the energy crisis.

The next chapter discusses the objectives and methodology applied to prepare the report (Chapter 2), and the following chapters present the results of the study with respect to the following topics:

- National policies contributing to achieving the EU 2030 Goals for energy efficiency in buildings (Chapter 3).
- Building and energy statistics in recent years (Chapter 4).
- Characterisation of the educational offer related to energy refurbishment (Chapter 5).
- Relevant projects on skills in construction, with special mention of the Construction Blueprint project (Chapter 6).
- Competence gaps between the current situation and the needs for 2030 (Chapter 7).
- Barriers to the qualification of construction professionals (Chapter 8).

The analysis of the information gathered in these sections has allowed the generation of conclusions, which are presented in Chapter 9. The authors and contributors involved in the preparation of this study are listed in Chapter 10. Finally, the Status Quo includes a Glossary of relevant terms used throughout the report (Chapter 11) and a reference Bibliography (Chapter 12).

This document will be the main reference document when developing a Training Roadmap, also as an outcome developed in Construye 2030. In this way, the Roadmap developed in 2011-2012 will be renewed, updating the actions necessary to address the training needs detected.

2. Objectives and methodology of the study

2.1. Goals

The purpose of this Status Quo is to reflect the new reality of the construction sector in terms of its contribution to the 2030 climate goals, with a particular focus on the skills that are currently needed throughout the construction value chain.

To this end, a comprehensive analysis of primary and secondary sources has been conducted, analysing the changes that have taken place over more than a decade, to present the evolution of construction in its transition towards a more sustainable and environmentally friendly sector.

The objectives of the study are:

Figure 4. Objectives of the Status Quo study. Source: own elaboration.

- Identifying current **national policies** in the field of energy, education system, integration of renewable energy in building HVAC systems (including heat pumps), etc., that are being implemented in our country to contribute to the 2030 Climate Goals on energy and climate in buildings.

- Analysing the **relevant data** on the **construction and energy sectors**, analysing statistics on the available building stock, annual rate of new buildings and renovations, number of nearly zero-energy buildings, labour market in the construction sector, energy and renewable energy consumption, etc.

- Studying the **training offer of vocational and university training systems** for the building sector, and the extent to which these systems integrate the right skills to achieve better energy performance of buildings and contribute to the 2030 Climate Goals.

- Supplementing the results of the **Construction Blueprint** project, in its search for training needs for the construction sector, by focusing on national needs.

- Identifying the **needs for training and skill gaps** that currently exist in Spain in the entire value chain of the construction sector, and which are essential to conduct the renovation of buildings with a high energy performance, the use of renewable energies or being able to build new buildings with nearly zero energy consumption.

- Knowing the **barriers** that are currently hindering the qualification or requalification of workers in the construction sector.

2.2. Study methodology

Status Quo is the result of the collaborative work of the authors of this report in their analysis of primary and secondary sources conducted between October 2022 and July 2023. The analysis of secondary sources has subsequently been revised and is updated to April 2024.

Bearing in mind that this is a report update, and that one of the objectives was the comparability of results, the methodology used in this Status Quo has been similar to that of the one published in 2012, i.e. differentiating the activities into four types of techniques: documentary analysis, experimental analysis, validation of results by experts and forecast analysis.

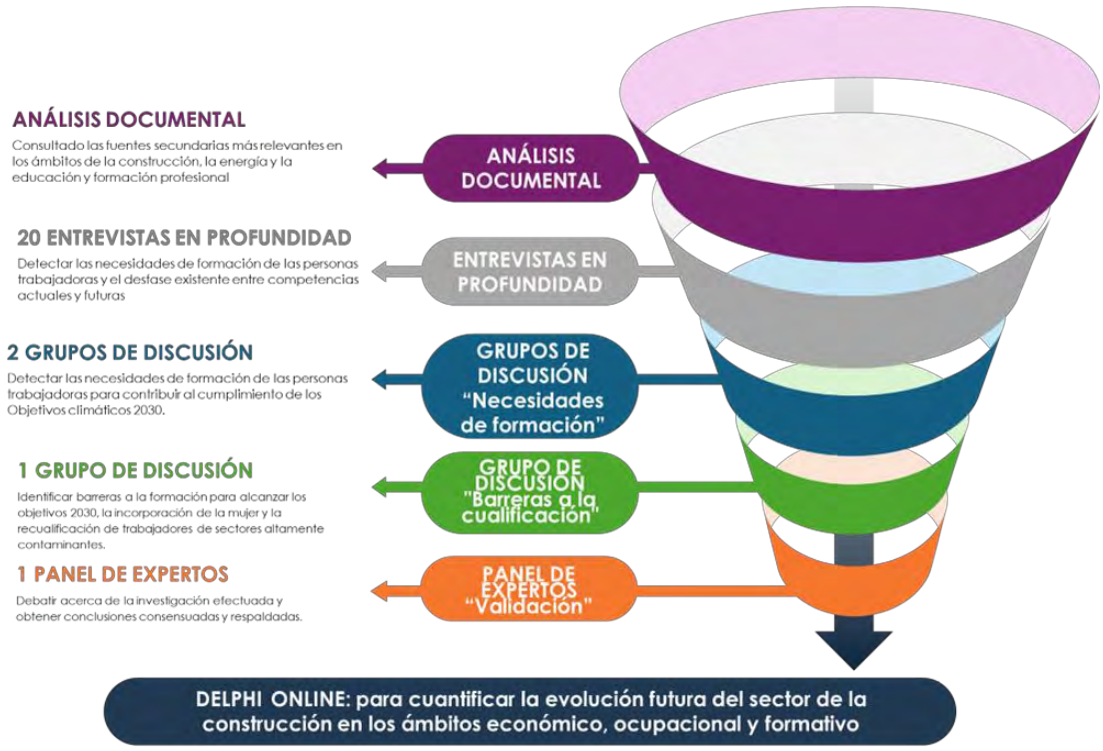


Figure 5. Analysis Methodology. Source: Prepared in-house.

Documentary analysis - In order to set the bases of the Status Quo study, we have conducted a documentary search and analysis, in which the most relevant secondary sources in the fields of construction, energy and education and professional training. This analysis, revised and updated to April 2024, has been used to:

- Collect available statistical data relevant to the objectives of the analysis.
- Serve as a basis for the development of the various research instruments for the experimental phase.
- Support and shape the drafting of the different points foreseen in the report.

Experimental analysis - After conducting the documentary analysis, interviews and expert groups were conducted as a primary source that provided relevant information that could not have been addressed through a documentary analysis.

The fieldwork was approached from the **Quintuple Helix perspective**, ensuring that the testimonies of experts from the political, economic, educational, social and environmental spheres of the construction sector were collected. This methodology was used in the Construye 2020+ and Construction Blueprint projects, with satisfactory results.

Image 1. Photos of the focus groups. Source: own source.

The fieldwork has been conducted between May and July 2023, performing the following activities:

TECHNICAL	PARTICIPANTS	PURPOSE	FORMAT AND LOCATION
In-depth interviews	20	Detect the training needs of workers and the gap between current and future skills.	Face-to-face, multiple locations
2 Focus groups "Training needs"	18	Identify the training needs of workers to contribute to the achievement of the 2030 Climate Goals.	On-site (Madrid and Seville)
Discussion group "Barriers to qualification".	9	Identify barriers to training to achieve the 2030 goals, the incorporation of women and the re-skilling of workers in highly polluting sectors.	Online

Expert panel "Validation"	8	Discuss the research conducted and reach consensual and supported conclusions.	On-site (Madrid)
Delphi	15 in first round 10 in second round	Quantify the future development of the construction sector in the economic, occupational and training fields.	Online

Table 1. Field work. Source: own source.

In addition to the interviews and expert groups, this report has benefited from the following:

Figure 6. Other sources for the preparation of the status quo. Source: own source.

Validation – Once the documentary and experimental analysis have been performed, the validation phase of the results obtained in both phases was conducted in order to contrast the validity of the results and the support of the research conducted, so as to obtain consensual and supported conclusions that reliably show the reality or current "Status Quo" in this field. To this end, a panel of experts was organised in which the participants answered a questionnaire in which they showed their level of agreement with the conclusions obtained and then discussed them as a group.

Forecast analysis - Finally, in order to determine and quantify the evolution of the sector from different points of view (economic, occupational and training), a forecast analysis was conducted using the Delphi technique.

In order to enable the reader of the report to identify in the text the primary information (chapters 5, 7, 8 and 9), the considerations of the experts are marked with the following icon:

3. National policies and strategies aimed at achieving the 2030 goals

3.1. In the field of energy

The construction sector is key to achieving the EU's energy and environmental goals. At the beginning of 2020, in Spain, there were 26 million dwellings, occupying 3,424 million m2 of gross floor area and another 2,229 million m2 of gross floor area for non-residential use[1], responsible for 25.1% of CO2 emissions and 30% of energy consumption[2]. The entire sector must move very quickly to achieve the EU's emission reduction and energy efficiency targets.

The most relevant European directives and regulations for achieving the 2030 Goals are:

1. Directive (EU) 2018/844 of the European Parliament and of the Council of 30 May 2018 amending Directive 2010/31/EU on the energy efficiency of buildings and Directive 2012/27/EU on energy efficiency.

2. Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy efficiency of buildings.

3. Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources.

4. Commission Recommendation (EU) 2019/786 of 8 May 2019 on the rehabilitation of buildings.

5. Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No 401/2009 and (EU) 2018/1999 ("European Climate Legislation").

The following is a brief description of current (and planned) National policies and strategies aimed at achieving the EU 2030 Goals for energy in buildings. The ultimate objective is to decarbonise the sector by 2050.

[1] ERESEE 2020.

[2] Universidad Pontificia de Comillas, 2020. Observatory for Energy and Sustainability in Spain, pp. 20 and 21.

3.1.1. National policies and strategies aimed at achieving the 2030 Goals

Law on Climate Change and Energy Transition (2021): Law 7/2021, of 20 May, on Climate Change and Energy Transition transposes Directive 2018/844 of the European Parliament which provides that by 1 January 2023, all buildings for use other than private residential use that have a parking area with more than twenty parking spaces, either inside or in an assigned outdoor space, must comply with the requirement relating to the minimum provisions for electric vehicle charging infrastructure established in the Technical Building Code.

In its Title II Renewable energies and energy efficiency Art. 8 Energy efficiency and building rehabilitation states that the Government will promote and enable the efficient use of energy, demand management and the use of energy from renewable sources in the field of building construction, without prejudice to the competencies corresponding to the Autonomous Communities, with special reference to buildings inhabited by people in vulnerable situations.

National Energy Efficiency Fund (FNEE): It derives from the Energy Efficiency Directive 2012/27 (EED) and establishes in its Article 7 the obligation for each Member State to justify an amount of cumulative energy savings for the period 2014-2020. Once the 2014-2020 period has ended, the modification of the EED by Directive (EU) 2018/2002 defines a new savings target for each Member State for the period 2021-2030, with Spain's target for the new period being 36,809 ktoe. The National Energy Efficiency Fund (FNEE), established by Law 18/2014, of 15 October and amended by Royal Decree-Law 23/2020, of 23 June, created the national system of energy efficiency obligations, under which a national annual energy savings quota, known as savings obligations, was allocated.

National Integrated Energy and Climate Plan 2021-2030 (PNIEC): In March 2020, the Council of Ministers agreed to submit the revised version of the National Energy and Climate Plan 2021-2030, the main national strategic planning tool integrating energy and climate policy. It emphasises the potential of energy rehabilitation of buildings and self-consumption, especially shared consumption. The measures envisaged in the plan will enable national minimum targets to be met by 2030, as set out in **Law 7/2021 on Climate Change and Energy Transition**. Following the planned update of the PNIEC in 2023, a public consultation was held during August and September 2022, resulting in a draft that the government submitted to the European Commission on 28 June, which in turn is subject to public consultation until 4 September 2023.

Long-term strategy for the rehabilitation of buildings (ERESEE): The **ERESEE 2020** is part of the requirement of Directive 2018/844 (amending the Energy Performance of Buildings Directive, EPBD, and the EED) and at the same time must be integrated into the National Integrated Energy and Climate Plan 2021-2030 (PNIEC), due to the implementation of Regulation 2018/1999 on EU Governance and Climate Action. The ERESEE sets out a roadmap with intervention scenarios, measures and progress indicators for the rehabilitation of the building stock, the cost-effective transformation of existing buildings into energy-efficient buildings and the decarbonisation of the sector by 2050. This strategy, the result of a collaborative process of public participation with various representatives of the sectors concerned, defines

the intervention scenarios, measures and progress indicators for the energy rehabilitation of the building stock and the decarbonisation of the building sector in 2050. To this end, the MIVAU has promoted the creation of the four working groups foreseen in the ERESEE 2020, which are the Interministerial Technical Working Group, the Technical Working Group with the Autonomous Communities, the Technical Working Group with Local Entities and the Technical Working Group with Sector Agents.

National Climate Change Adaptation Plan (PNACC) 2021-2030: The PNACC 2021-2030, launched in October 2020, is the basic planning instrument to promote coordinated action to address the effects of climate change in Spain. Its main objective is to avoid or reduce present and future damage from climate change and to build a more resilient economy and society. With regard to buildings, the objective is to integrate adaptation to climate change in the building sector, advancing in regulations to improve the energy and water performance of buildings, in line with projected future climate scenarios.

Long Term Decarbonisation Strategy (ELP 2050): The ELP 2050, launched in November 2020, is the long-term strategy for a modern, competitive and climate-neutral Spanish economy in 2050. It has been implemented pursuant to the guidelines of Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the governance of the Energy Union and Climate Action, which establishes the need for the development of long-term strategies by Member States. The ELP 2050 estimates that the building sector will be fully decarbonised by mid-century. To this end, it is essential to improve the efficiency of existing buildings, and for new buildings to have almost zero energy consumption. In this respect, energy rehabilitation is key. The biggest changes to achieve this transition will be in air conditioning systems: 96% of them will be renewable by mid-century.

Energy Poverty Strategy: In April 2019, **the National Strategy against Energy Poverty 2019-2024**, drawn up by the Ministry for Ecological Transition, was approved, complying with the provisions of Royal Decree 15/2018 on urgent measures for energy transition and consumer protection. The Strategy establishes, for the first time, a definition of the situation of energy poverty and vulnerable consumers, diagnoses the situation in Spain, determines lines of action and sets targets for reducing this social problem that affects more than 3.5 million people in our country.

3.1.2. Summary of planned activities in relation to the implementation of the EPBD and the RES Directive

The National Energy Efficiency Action Plan 2017-2020 (NEEAP) responded to the requirement of Article 24.2 of the EED Directive, which required all EU Member States to submit such plans. The NEEAPs set out estimated energy consumption, planned energy efficiency measures, long-term rehabilitation strategies and the improvements that each EU country expects to achieve in order to reach the EU's 20% target by 2020.

In addition, EU countries were required to report annually on progress towards their national energy efficiency targets. For the period from 2021 to 2030, replacing NEEAPs, each EU country must develop a

10-year National Integrated energy and climate plan (currently PNIEC, mentioned in the previous point), outlining how it intends to meet the different targets for 2030, including energy efficiency.

The measures envisaged in the plan will enable the following minimum national targets to be achieved by 2030, as set out in Law 7/2021 on climate change and energy transition: 23% reduction of greenhouse gas (GHG) emissions compared to 1990; 42% renewables in energy end-use. This is double the 20% of 2020; 39.5% energy efficiency improvement over the next decade; 74% renewable energy presence in the electricity sector, consistent with a trajectory towards a 100% renewable electricity sector by 2050.

The following are those PNIEC measures that are directly linked to the building sector, and those that are cross-cutting to this sector:

MEASURES DIRECTLY LINKED TO THE BUILDING SECTOR	CROSS-SECTIONAL MEASURES IN THE BUILDING SECTOR
1.4 Development of self-consumption with renewables and distributed generation 2.6 Energy efficiency in existing buildings in the residential sector 2.8 Energy efficiency in tertiary sector buildings 2.9 Energy efficiency in cooling equipment and large air-conditioning installations in the tertiary sector and public infrastructure 2.11 Promotion of energy services 2.17 Financial measures: National Energy Efficiency Fund 4.6 Data access 4.11 Fighting energy poverty	1.2 Demand management, storage and flexibility 1.3 Adaptation of electricity grids for the integration of renewables 1.13 Local energy communities 1.14 Promoting a proactive role for citizens in decarbonisation 1.15 Fair Transition Strategy 1.17 Training of professionals in the renewable energy sector 1.19 Knowledge generation, dissemination and awareness raising 2.7 Renovation of residential equipment 2.13 Energy audits and management systems 2.14 Training of energy efficiency professionals 2.15 Communication and information on energy efficiency 3.3 Refuelling points for alternative fuels

Table 2. Recovery, Transition and Resilience Plan measures linked to the building sector. Source: Prepared in-house

3.1.3. Mandatory regulations on energy efficiency and renewable energies applied to building construction

Technical Building Code (*Código Técnico de la Edificación*)

The Technical Building Code (CTE) is the regulatory framework that establishes the requirements that buildings must meet in relation to the basic safety and habitability requirements set out in Law 38/1999 of 5 November 1999 on Building Regulations (LOE).

Directive 2018/844 of May 2018 conditions the next revision of the **Basic Energy Saving Document of the CTE**, which should take place between 2023 and 2024 in order to comply with the commitment to update it every 5 years. This amendment is part of the *"Clean Energy for All Europeans"* package. This is a comprehensive set of legislation in place from 2020 to enable Europe's energy transition and meet the EU's Paris Agreement commitments to reduce greenhouse gas emissions. It consists of eight pieces of legislation, many of which are important for the building sector, as they will influence building rehabilitation policy in the coming decades: **EPBD**, the **EED**, the **Governance Regulation (GOV)** and the **Renewable Energy Directive (RED)**.

In December 2019, a **modification of the CTE** has taken place through **Royal Decree 732/2019**, which responds to the EPBD of 2010, following the guidelines and regulations of the European Community and within the framework of energy efficiency in buildings and regulatory requirements for compliance with international climate and energy commitments. In addition to establishing new energy performance requirements for buildings, it also updates the definition of Nearly Zero Energy Consumption Buildings by adjusting the values of these requirements.

In June 2022, **the Royal Decree 450/2022, which amends the CTE** came into force. The new Decree introduces new requirements in *section HE-5*, relating to minimum renewable energy generation and creates a new **section HE-6**, on minimum provisions for electric vehicle charging infrastructure. After this last update, the Basic Document on Energy Saving (DB-HE) establishes the following basic requirements:

BASIC REQUIREMENT	DESCRIPTION
HE 0: Limiting energy consumption	Limitation of energy consumption according to climate zone, building use and scope of intervention. Use of renewable energy.
HE 1: Conditions for the control of energy demand	Buildings shall have a thermal envelope with characteristics that limit primary energy needs to achieve thermal comfort.
HE 2: Conditions for thermal installations	The thermal installations in buildings shall be appropriate for the thermal comfort of the occupants.
HE 3: Lighting installation conditions	Buildings shall have lighting installations that are appropriate to the needs of their users and at the same time energy efficient, with a control system that allows their operation to be adjusted to the real occupancy of the area, as well as a regulation system that optimises the use of natural light in areas that meet certain conditions.
HE 4: Minimum contribution of renewable energy to cover domestic hot water demand	The buildings will meet their DHW and indoor pool heating needs largely by using energy from renewable sources or renewable cogeneration processes; either generated in the building itself or through connection to a district heating system.
HE 5: Minimum electricity generation from renewable sources	Buildings shall have systems for the generation of electricity from renewable sources for own use or supply to the grid.

HE 6: Minimum provisions for electric vehicle recharging infrastructure	Buildings shall have a minimum infrastructure to enable charging electric vehicles.

Table 3. DBHE Basic Requirements. Source: compiled by author.

Regulations on Building Heating Installations

The Regulation on Thermal Installations in Buildings (RITE) establishes the conditions to be met by installations designed to meet the demand for thermal comfort and hygiene through heating, air-conditioning and domestic hot water systems and equipment, in order to achieve a rational use of energy and achieve adequate health and safety conditions.

In April 2013, through **Royal Decree 238/2013**, certain articles and technical instructions of the RITE were modified. The amendments established have the dual purpose of incorporating into Spanish law the obligations arising from Directive 2010/31/EU, in relation to thermal installations in buildings, and to update the RITE, adapting it to the new needs of energy saving and efficiency. In March 2021, by means of **Royal Decree 178/2021**, amending Royal Decree 1027/2007 of 20 July 2007, approving the RITE, thus transposing Directive (EU) 2018/844.

Energy efficiency certification of buildings

The energy performance certification of buildings is a requirement derived from Directive 2002/91/EC of the European Parliament, transposed into Spanish law through Royal Decree 47/2007, of 19 January, which approves the basic procedure for the energy performance certification of newly constructed buildings.

Subsequently, it has been amended by Directive 2010/31/EU, with Royal Decree 235/2013 of 5 April, which made the energy performance certificate for all or part of a building, as appropriate, mandatory for sale and lease contracts and incorporated the Basic procedure for the energy performance certification of existing buildings.

Royal Decree 56/2016 of 12 February 2016 included several provisions regarding energy audits, accreditation of service providers and energy auditors. With the aim of promoting the efficiency of energy supply, incorporating the need for inspection of energy audits and modifying the content of the model.

Finally, Royal Decree 390/2022, of 1 June, seeks to give preference to users of renewable energies in order to achieve lower CO2 emissions into the environment.

3.1.4. Expected contribution of the construction sector to the 2030 Goals

The weight of the buildings sector in reaching the 2030 Climate Goals is difficult to calculate accurately, as it is distributed among the diffuse sectors, which cover activities not subject to emissions trading,

including residential, commercial and institutional sectors, together with transport, agriculture and livestock, waste management, fluorinated gases and industry not subject to emissions trading. From the point of view of the whole life cycle of the building, emissions associated with those that are part of the sectors subject to emissions trading, e.g. cement, steel, ceramics, tiles and bricks, glass, would also be part of the building sector.

The current version of the PNIEC proposes an overall reduction in emissions of 23% below 1990 levels by 2030. Within this reduction, diffuse sectors contribute a 39% reduction in 2030 compared to 2005 levels and the remaining 61% of the reduction is due to sectors subject to emissions trading.

The breakdown of the expected evolution of emission reductions is as follows:

EVOLUTION OF EMISSIONS (THOUSANDS OF TONS OF CO_2 EQUIVALENT)						
Years	**1990**	**2005**	**2015**	**2020***	**2025***	**2030***
Years	59,199	102,310	83,197	87,058	77,651	59,875
Transport	65,864	112,623	74,051	56,622	26,497	20,603
Electricity generation	45,099	68,598	40,462	37,736	33,293	30,462
Industrial sector (combustion)	28,559	31,992	21,036	21,147	20,656	20,017
Industrial sector (process emissions)	17,571	31,124	28,135	28,464	23,764	18,397
Residential, commercial and institutional sectors	21,885	25,726	22,854	23,247	21,216	19,184
Livestock	12,275	10,868	11,679	11,382	11,089	10,977
Crops	9,825	13,389	14,375	13,657	11,932	9,718
Residuos	10,878	13,078	11,560	12,330	11,969	11,190
Refining industry	2,161	1,020	782	825	760	760
Other energy industries	9,082	11,729	11,991	12,552	11,805	11,120
Other sectors	3,837	3,386	4,455	4,789	4,604	4,362
Fugitive emissions	1,358	1,762	1,146	1,236	1,288	1,320
Product use	64	11,465	10,086	8,267	6,152	4,037
Fluorinated gases	**287,656**	**439,070**	**335,809**	**319,312**	**262,675**	**221,844**

**The data for 2020, 2025, and 2030 are projections based on the National Integrated Energy and Climate Plan (PNIEC in its Spanish acronym) Target Scenario.*

Table 4. Evolution of emissions (thousands of tonnes of CO2 equivalent). Source: Ministry for Ecological Transition and the Demographic Challenge, 2019.

Part of the expected **reductions are expected from electrification and the use of thermal renewables** in heating and cooling installations. The progressive decarbonisation of electricity production is part of the PNIEC and consistent with the switch to electricity-based installations. For example, by 2030 compared

to 2021, electricity generation increases from 10,208 to 21,792 ktoe and heat pumps increase from 629 to 3,523 ktoe.

With regard to energy and energy efficiency, there is no clear estimate of the weight of the sector as a whole in achieving the targets set at national level. The current PNIEC endorses the 32.5% energy efficiency improvement target (based on primary energy) in 2030 approved by the European Union and improves on it, as the measures put in place are expected to achieve a 39.5% improvement in 2030.

The main measure within the PNIEC is **rehabilitation**, setting the following targets, which would account for almost 17% of the reduction in final energy consumption:

- Improving the energy efficiency (thermal envelope) over the decade of a total of 1,200,000 dwellings.

- Improving the energy efficiency of 300,000 dwellings/year on average.

The promotion of renewable self-consumption is also part of the measures aimed at the buildings sector.

Meanwhile, the ERESEE cumulative target between 2020 and 2030 (-26,394 Gwh) is equivalent to a reduction of 41.1% compared to 2020 consumption. This gives a target of -6,319 thousand tonnes of CO2 for this period.

3.1.5. Provisions on buildings within the Recovery, Transformation and Resilience Plan

The **European Reconstruction Fund** (*Next Generation)* is the exceptional funding instrument agreed at the European Council in response to the 2020 pandemic. These funds are structured in two instruments: REACT-EU and the Resilience and Recovery Mechanism. The latter is being implemented in Spain through the **Recovery, Transformation and Resilience Plan**, and it is divided into four axes: ecological transition, digital transformation, social and territorial cohesion and gender equality. These axes are projected in 10 leveraged policies that drive economic recovery in the short term. Each of these is structured into Components, which in turn articulate the investments and renovations to modernise the country.

The Lever I **Urban and rural agenda, fight against depopulation and development of agriculture**, is linked to improving the energy efficiency of the building stock. Its Component 2 includes a **Dwelling rehabilitation and urban regeneration plan,** in which energy efficiency and an increase in social rental dwelling are promoted. The Plan is managed under a model of co-governance of the Ministry of Housing and Urban Agenda and the Ministry for Ecological Transition and the Demographic Challenge with the Autonomous Communities and Local Entities.

COMPONENT 2	PROGRAMME	DESCRIPTION
C02.I01	Rehabilitation programme for economic and social recovery in urban environments	Royal Decree 853/2021 of 5 October. This programme includes different grants for rehabilitation at neighbourhood, office and building level, energy efficiency improvements and the preparation of rehabilitation projects.
C02.I02	Programme for the construction of social rented dwelling in energy-efficient buildings	Royal Decree 853/2021 of October. A programme that promotes the construction of social rental dwelling in energy-efficient buildings through the provision of public land and subsidies.
C02.I03	Energy Rehabilitation Programme for Buildings (PREE)	Programme aimed at the energy rehabilitation of buildings in municipalities with demographic challenges, with the objective of improving their energy efficiency and sustainability.
C02.I04	Regeneration programme and demographic challenge	It includes the Programme for the Energy Rehabilitation of Buildings in Demographically Challenged Municipalities (PREE 5000) and the Programme of aid for local clean energy projects (DUS 5000).
C02.I05	Programme to promote the rehabilitation of public buildings	Programme aimed at territorial public administrations with the aim of rehabilitating public buildings that are susceptible to improvement.
C02.I06	Aid programme for the preparation of pilot projects for local action plans of the Spanish Urban Agenda.	Programme that supports the development of pilot projects of Local Action Plans of the Spanish Urban Agenda.
C02.I07	ICO loan facility to promote social dwelling	to develop a new loan facility aimed at financing social rental dwelling development actions.

Table 5. Programmes included in component 2. Dwelling rehabilitation and urban regeneration plan. Source: Prepared by the author based on planderecuperacion.gob.es/, after approval of the addendum in October 2023.

3.2. In the field of vocational education and training

3.2.1. National policy and strategy related to green competencies and employment

Legislation governing the national education and vocational training system

Law on Education: The education system provides for 10 years of compulsory education, from age 6 to 16. Organic Law 3/2020 has incorporated for the first time explicit references to Education for Sustainable Development and Education for Global Citizenship, reflected in the 2030 Agenda, incorporating specific

competencies in these courses with the aim that students generate empathy towards their natural and social environment.

Law on Vocational: Organic Law 3/2022 orders and integrates vocational training and is currently in the process of regulatory development. The Law identifies new job opportunities to which the VET system must respond. Specifically, it mentions: energy rehabilitation of buildings; installation and maintenance of renewable energy plants; waste composting; urban horticulture and energy saving and efficiency consultancy.

Law regulating the vocational training system for employment in the workplace: Law 30/2015 is currently being updated at the dialogue table with the social partners.

University System Law: One of the main novelties introduced by Organic Law 2/2023 is to encourage access to university education at any age. Therefore, "own lifelong learning qualifications" will be established through different modalities, including so-called micro-credentials, micro-modules and other short-term qualifications.

Law on Employment: Law 3/2023 assumes the change in occupations brought about by technological change, causing many occupations to disappear, but different ones to emerge and modifying the rest. This law proposes to significantly increase the capacity of the administration to re-qualify, guide and assist jobseekers, and to reduce horizontal gender segregation. It also recognises oral and written communication competencies, digital and sustainability competencies as core competencies for employability. In addition, for a male-dominated sector such as construction, the law promotes employment incentives aimed at reducing the employment gap.

Plans and Strategies in the framework of the Recovery, Transformation and Resilience Plan

Lever VII addresses the improvement of education and knowledge, lifelong learning and competencies development. Numerous actions have been conducted since 2021, channelled from the national and regional public administration. The following table shows only actions directly linked to the vocational training system conducted to date, and also committed until 2027.

LEVER VII	EDUCATION AND KNOWLEDGE, LIFELONG LEARNING AND COMPETENCY DEVELOPMENT
COMPONENT 19	**NATIONAL DIGITAL COMPETENCIES PLAN**
RENOVATION	Development of the National Digital Competencies Plan (2021).
INVESTMENT OBJECTIVES	
Digital Transformation of Education	Plan for the Digitalisation and Digital Competencies of the Education System (2022).
	Digital Vocational Training Plan (not started)

Digital Transformation of Education	Development of training spaces in digital competencies demanded by the production sectors, and in the accreditation of digital competencies acquired through work experience.
	Qualification and re-qualification for working and non-working population
COMPONENT 20	**STRATEGIC PLAN FOR THE PROMOTION OF VOCATIONAL TRAINING (PVT)**
RENOVATION	VET modernisation plan
	Law on the Organisation of the Integrated Vocational Training System linked to the National Qualifications System.
INVESTMENT OBJECTIVES	
Reskilling and upskilling of the labour force linked to vocational qualifications Digital Transformation of Vocational Education and Training	ACREDITA Plan Assessment and accreditation of professional competencies acquired through work experience or non-formal training. As of February 2023, 256,925 units of competencies have been registered and admitted to the procedure.
	Modular training aimed at reskilling and upskilling the employed and unemployed with special emphasis on training in emerging, fast evolving competencies.
Innovation and internationalisation of vocational training Reskilling and upskilling of the labour force linked to vocational qualifications Digital Transformation of Vocational Education and Training	Digital and green training applied to the production sectors for vocational training teachers
	Conversion of classrooms into spaces of applied technology that allow, from the educational centres, to bring closer the technology they will find in companies.
	Creation of entrepreneurship classrooms in public vocational training centres,
	A network of 50 centres of excellence, which stimulate research and the constant improvement of programmes and methodology at school level.
Reskilling and upskilling of the labour force linked to vocational qualifications	RE-DIMENSIONING OF VET OFFERING Programme
	New basic, intermediate and higher vocational training cycles, specialisation courses and modular offer. As of February 2023, more than 150,000 new places have been created.
	Development of innovation and knowledge transfer projects through partnerships between companies, vocational training centres and any other training and innovation institution in the territories.

Table 6. Components and investments developed in lever 6 Education and Knowledge, Lifelong Learning and Capacity Building, in the framework of the Recovery, Transformation and Resilience Plan.

Other national strategies: Tarjeta profesional de la Construcción (Construction Professional Card)

The Construction Professional Card, created in 2007, is the document that is a way of accrediting, among other data, the specific training received by the worker in terms of occupational risk prevention, as well as the professional category and the periods of occupation in the different companies in which the worker works.

The Fundación Laboral de la Construcción is the entity in charge of implementing, developing and disseminating the Professional Construction Card. Currently, the number of cards issued exceeds 725,000 units and, in 2022, more than 2,700 cards were processed.

3.2.2. Regional and national implementation of the EQF and other EU policies on education and training in the sector

European Qualifications Framework for Lifelong Learning

The European Qualifications Framework for Lifelong Learning (EQF) is a common European reference framework that allows European countries to compare their qualifications. The EQF uses 8 reference levels based on what a person actually knows and is able to do regardless of how they have acquired those competencies. In 2022, the Spanish Framework of Qualifications for Lifelong Learning was published, which is currently pending going through the process of «certification of compatibility» with the European Framework of Qualifications for Lifelong Learning, which entails the assessment of this regulation by international experts.

EQF LEVEL	QUALIFICATIONS (DEGREES AND CERTIFICATIONS)
1	Primary education
2	Certificate of completion of 2nd year of Secondary Education (ESO) | Basic Level Vocational Training Certificate for students with special educational needs or specific groups.
3	3A: ESO Compulsory Secondary Education or Basic Technician diploma. 3B: Certificate of Professionalism. Level 1.
4	4A: Baccalaureate High-school diploma. Diploma in Vocational Training, Professional Music Education, Professional Dance Education, Plastic Arts and Design or Sports. 4B: Certificate of Professionalism. Level 2. 4C: Intermediate Specialisation Course
5	5A: Diploma in Higher Vocational Training (FP); Higher Technical diploma in Plastic Arts and Design; Higher Technical Sports diploma. 5B: Certificate of Professionalism. Level 3. 5C: Higher Level Specialisation Course
6	Graduate Degree; Higher Degree in Higher Artistic Education.
7	Graduate Degree of at least 300 ECTS credits comprising at least 60 ECTS credits at Master's level, which has obtained this level of qualification by resolution of the Council of Universities. University Master's degree. | Master's Degree in Artistic Education.
8	PhD Doctorate degree.

Table 7. Correspondence between the studies of the Vocational Training system and the EQF levels, pending evaluation by international experts of this Regulation. Source Royal Decree 272/2022, of 12 April, establishing the Spanish Qualifications Framework for Lifelong Learning.

European Quality Assurance Framework for Vocational Education and Training (EQAF)

This Framework (EQAVET) is a tool that proposes a set of common descriptors and reference indicators for the quality assurance of the vocational education and training system and institutions. They are structured according to the phases of the quality cycle, i.e.: 1) **Planning**, 2) **Implementation**, 3) **Evaluation**, and 4) **Review**, with the aim of contributing to the evaluation and quality improvement of the vocational training system and centres.

The new VET Law articulates, for the first time, the evaluation and quality objectives of the VET system, in line with the EQAVET principles. It establishes the obligation for VET centres to have a mechanism for the evaluation and quality of the system and incorporates the obligation for an annual report on the state of vocational training.

3.3. In the field of digitisation in the construction sector

Law 7/2022 on waste and contaminated soils for a circular economy has as its objectives the principles governing the circular economy, i.e. to make efficient use of resources, with a firm strategic commitment from all public administrations, as well as the involvement and commitment of all economic and social agents. This law boosts digitalisation in the construction sector as it establishes the obligation to have digital books of the materials used in new construction works, as well as eco-design requirements for construction and building projects. It also makes it compulsory to create an electronic file in which the quantity, nature and origin of the waste generated is recorded in chronological order.

Law 9/2022, on the Quality of Architecture has among its objectives the promotion of digitalisation and the use of technologically innovative tools aimed at making the construction process more efficient, competitive, safe and of high quality. As well as incorporating BIM methodology in public procurement and the digital management of public assets. In this regard, on 27 June 2023, the Council of Ministers approved the Plan for the incorporation of BIM methodology in public construction contracts of the General State Administration and the state public sector between 2024 and 2030.

3.4. In the field of intelligent buildings, including e-mobility

On 30 May 2018, Directive (EU) 2018/844 of the European Parliament and of the Council was adopted, driving the introduction of specific requirements for the implementation of electric vehicle charging infrastructure in car parks in buildings.

The aforementioned PNIEC submitted by Spain to the European Commission considers the promotion of electric mobility as a measure to reduce energy consumption and vehicle fleet emissions through, among other promotion and support mechanisms, the adaptation of regulations and the incorporation of European Union law to enable the deployment of electric vehicle charging infrastructure in line with the implementation of the fleet's electrification.

In order to comply with these objectives and to partially transpose the Directive in this regard, a new basic energy saving requirement is introduced in the Technical Building Code relating to the minimum provisions for electric vehicle charging infrastructure, which is developed in the new **Section HE 6 "Minimum provisions for electric vehicle charging infrastructure"** of the Basic Document DB-HE on "Energy Saving".

On the other hand, it should be noted that **Law 7/2021**, of 20 May, on climate change and energy transition, referred to the CTE for this regulation to establish the minimum electric vehicle charging infrastructure provisions for existing buildings for use other than private residential use that have a parking area with more than twenty spaces, inside or in an assigned outdoor space, which should be in place before 1 January 2023. However, these minimum allocations have finally been determined by Royal Decree-Law 29/2021, of 21 December, which adopts urgent measures in the energy field to promote electric mobility, self-consumption and the deployment of renewable energies, which includes this requirement in Article 4.

In order to complete the regulation of electric vehicle charging infrastructures, Royal Decree 1053/2014, of 12 December, is also amended, approving a new **Complementary Technical Instruction (ITC) BT 52 "Special Purpose Installations. Infrastructure for charging electric vehicles",** of the Low Voltage Electrotechnical Regulations, approved by Royal Decree 842/2002, of 2 August, and amending other complementary technical instructions thereof.

3.5. In the field of the circular economy in the construction sector

The European Commission adopted in March 2020 a new Circular Economy Action Plan, which was one of the main elements included in the European Green Pact. The aim was to ensure that less waste is generated; to make circularity work for people, regions and cities and to lead circular economy efforts.

At state level, the Spanish Strategy for a Circular Economy, **España Circular 2030**, established the bases to boost a new production and consumption model. The **first Circular Economy Action Plan (PAEC 2021-2023)** arose with a cross-cutting character and to maintain coherence with initiatives and policies undertaken at EU level.

In April 2022, the new **Law 7/2022 on Waste and Contaminated Land for a Circular Economy** came into force, which will be one of the main pieces of legislation to boost the circular economy.

In March 2022, the **Strategic Project for Economic Recovery and Transformation (PERTE)** of the **Circular Economy** was added, seeking the sustainability and circularity of its processes and to consolidate an innovative, sustainable and competitive industrial fabric that promotes digitalisation and is capable of reversing the effects of linear production.

The strategic framework has been completed with different **Circular Economy strategies at regional level**, with nine strategies already approved: Catalonia, Extremadura, Andalusia, Galicia, Navarra, the Basque Country, the Canary Islands, Castilla y León and Castilla-La Mancha, and three others are in the process of

being approved: Aragón, Region of Murcia, La Rioja. In addition, the Community of Madrid drives the campaign "Madrid7R Circular Economy", to promote the transition from a linear economic model to a circular economy model. At local level, and driven by the Spanish Federation of Municipalities and Provinces (FEMP), in November 2019 the **Local Strategy on Circular Economy** was also presented.

This wide range of regulations has shown that planning is important and that it must not only be formulated, but also implemented, monitored and evaluated.

3.6. In the field of environmental public procurement

Law 9/2017 on Public Sector Contracts establishes the regulation of public sector procurement in Spain. The objectives behind the law are to achieve greater transparency in public procurement, as well as to achieve better value for money. To achieve the latter objective, contracting authorities are obliged to ensure that award criteria are designed in such a way as to obtain high-quality works, supplies and services by including qualitative, environmental, social and innovative aspects linked to the subject matter of the contract.

This is reflected in Article 145 of the Law, requirements and types of contract award criteria, which explains that the environmental characteristics that contracting authorities may take into consideration to assess the best value for money may refer, among others, to the reduction of the level of greenhouse gas emissions, the use of energy saving and efficiency measures and the use of energy from renewable sources during the execution of the contract, the maintenance or improvement of natural resources that may be affected by the execution of the contract.

The Law also includes a novel article, Article 148, on the definition and calculation of the life cycle cost of a product, work or service.

One year later, the Interministerial Commission for the incorporation of green criteria in public procurement was created through Royal Decree 6/2018; and, in 2018, the **Green Public Procurement Plan for the General State Administration, its autonomous bodies and Social Security management entities (2018-2025)** was approved. The Plan defines green public procurement as the process by which authorities procure goods, works and services with a reduced life-cycle environmental impact compared to other goods, works and services with the same primary function that would be procured instead. Among other aspects, the Plan establishes a series of priority goods, works and services, for which it defines a series of criteria and specifications, and which are grouped into categories such as: Interior building lighting, Water heaters, Office building design and management, Electricity, Domestic bathroom fittings, Flush toilets and urinals, among others.

3.7. In the field of the integration of renewable energy and efficient heating and air-conditioning technology, in particular the deployment of heat pumps

Of particular importance in 2022 was the redefinition of the new European energy policy, through the aforementioned RepowerEU communication, which proposes, among other measures, the deployment of 4 million heat pumps by 2024 and 10 million by 2030, bringing the installed base to 60 million in that year; Regulation 2022/2577 of 22 December, which establishes a framework for accelerating the deployment of renewable energies and recognises heat pumps as being of "overriding public interest" as they contribute to public health and safety in the EU.

Also 2022 brought changes in the methodology for calculating the renewable energy provided by heat pumps, with the entry into force of Delegated Regulation 2022/759 of 14 December, according to which part of the energy extracted in "active" cooling can already be considered as renewable energy.

In the draft for the update of the PNIEC, mentioned in section 3.1.1, training measures are envisaged that refer to promoting the training of professionals in the energy efficiency and renewable energy sector. In this sense, in Spain, the ERESEE 2020 includes scenarios that incorporate the heat pump to replace (fossil fuel) boilers in current systems, while maintaining the hydraulic circuit and radiators. Similarly, the Roadmap for the decarbonisation of the building sector implemented in the Building Life project, includes in its scenarios the forecasts of the PNIEC and the ERESEE regarding the increase in the use of heat pumps (increasing from 629 to 3,523 ktoe according to the PNIEC in the period 2021-2030), as well as scenarios that would further accelerate the inclusion of heat pumps for heating and DHW equipment.

Finally, it is also worth mentioning that with the aim of accelerating the transition of heating and hot water systems, some Spanish companies, business associations, research centres and environmental organisations joined together in the Platform for the Decarbonisation of Heating and Hot Water. The Platform published its Constitutive Manifesto in which it proposed the development by the Administration of a "Heating Roadmap", setting targets for the installation of renewable heating systems in the short, medium and long term; massive investment in these systems, with special attention to people in vulnerable situations; and improved information to the public on these systems.

4. Statistics on the building stock and the sectoral labour market

4.1. Sector overview

Historical data on the sector

Construction is in a demographic, ecological and digital transition, and is key to meeting the Sustainable Development Goals of the 2030 Agenda. According to the latest annual report published by the Construction Industry Observatory and referring to the sector's activity in 2022, "construction has proven to be a solid sector with strong potential. Despite the pandemic and the current geopolitical context, it continues to be one of the economic engines and generators of employment, offering multiple professional career activities and job opportunities.

In this first section we will discuss the most relevant characteristics of the sector at national level, taking into account the data collected in the Previous Status Quo (2012) and the most recent data.

Activity in the building sector has increased compared to 2012, according to data provided by the Associations of Technical Architects on the number of **construction management visits**. In this regard, after the drastic fall in activity that began in 2007 and whose lowest point was recorded in 2013 and 2014, there has been a progressive recovery in the rate of new building permits granted, with the exception of 2020, when the COVID-19 pandemic broke out, with the consequent negative impact on the sector's performance. There has also been a progressive increase in the number of rehabilitation visas compared to the previous biennium.

Another indicator of the sector's activity, more short-term, are the municipal building permits, as not all approved projects end in the execution of the dwelling. In this case, it is important to note that during the years 2013-2015 the lowest number of municipal building permits was recorded within the period analysed, with a notable upward momentum in the years 2016-2019 driven by the construction of new dwelling.

Contribution of the construction sector to the country's economy

The contribution of the construction sector to national GDP in terms of Gross Fixed Capital Formation in 2012 was 9.9 %. Throughout the series analysed, this percentage decreased in the following years and increased from 2017 onwards, reaching 10 % in 2023. In terms of Gross Value Added, construction had a weight of 6.9 % of GDP in 2011, falling to 5.0 % in 2023.

Market stakeholders and main players in the supply chain

As mentioned above, construction has a direct impact on job creation and the economy. It should be pointed that, although it is difficult to obtain objective and reliable data on the true impact of the sector on other economic areas, it has an important impact on activities that are not statistically considered as part of the construction sector, but which are directly related to it (for example, engineering, architecture, auxiliary industry construction products, machinery, etc.), and which provide essential resources for the functioning of other sectors: for example, a road network for the transport sector; airport construction for the tourism sector; hospitals for the health sector or educational centres for the education sector.

The sector has been directly affected by the **increase in commodity and energy prices**, mainly since the end of 2020.

In the **manufacturing of construction materials** sector, according to data from the Spanish Confederation of Construction Product Manufacturers (CEPCO), the number of companies that manufacture construction products has decreased between 2008 and 2022, going from 47,039 to 31,967 companies, which has led to an accumulated loss of employment of 227,807 workers in these years in this sector.

On the other hand, the good performance of **exports of materials**, is worth mentioning, reaching a value of 29,217 million euros in 2023.

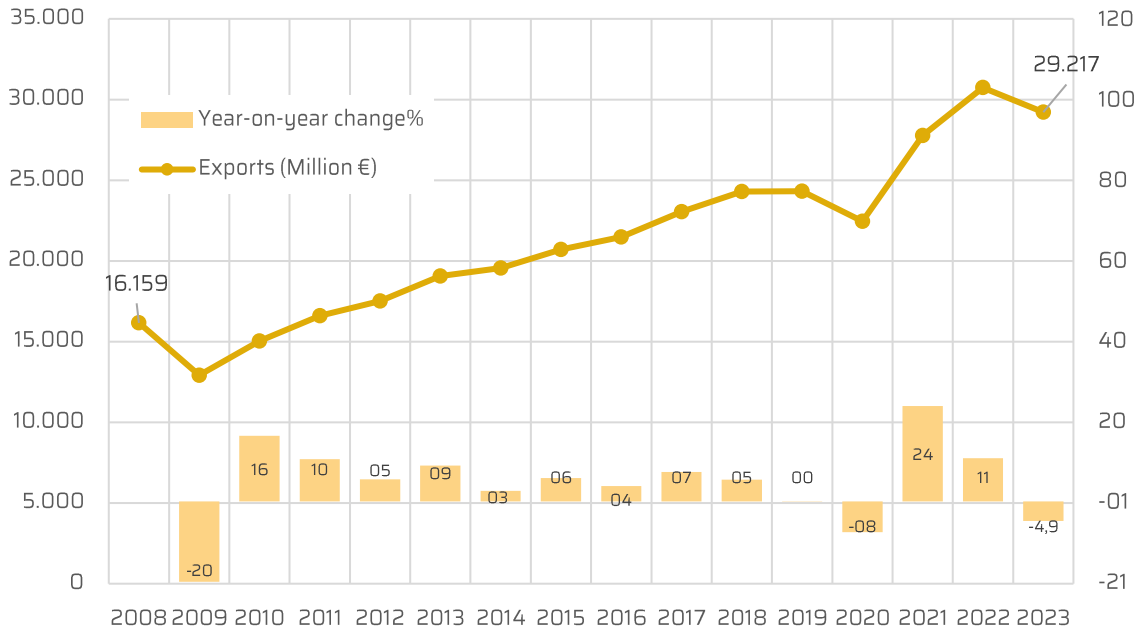


Chart 1. Exports of construction materials and products (euro millions). Source: Prepared by the Construction Industry Observatory (FLC) and updated with data from CEPCO.

Market trends and forecasts

The economic forecasts published by the European Commission in November 2022 point to a growth of the construction sector in Spain of 2.9 % in 2023 and 3.2 % in 2024. The FUNCAS forecast panel published in January 2024, puts the sector's growth in 2024 at 1.7 % and 3.2 % in 2025 (consensus average).

The construction sector in Spain has withstood the negative impact of the COVID-19 pandemic by demonstrating that it is key to the economy and employment generation, although by the end of 2021 it had not yet reached the level of production recorded in 2019.

In the short term until 2025, according to Euroconstruct estimates, the average annual growth in the residential building sub-sector would be 2.5 %, while in the non-residential building sector this figure would be 1.5 %.

Dwelling and building rehabilitation as well as public infrastructure works present a more promising scenario driven by the Next Generation EU funds.

Notwithstanding the above, the context suffers from the consequences of the current geopolitical conflicts, higher commodity prices, in particular energy prices, and rising interest rates, are factors of uncertainty.

The implementation of the Recovery, Transformation and Resilience Plan approved in July 2021 entails an unprecedented volume of investment which, directly and indirectly, will have a positive impact on the sector's performance. Of the different budget items that make up the Plan, and to highlight those with a more direct relationship with construction, it is worth highlighting the one earmarked for dwelling rehabilitation and urban regeneration (Component 2) with an estimated investment of 6.82 billion euros. Likewise, a large part of the measures of the shock plan for sustainable, safe and connected mobility in urban and metropolitan environments (Component 1) with an estimated investment of 6,536 million euros, and of the measures planned in the sustainable, safe and connected mobility component (Component 6) with an estimated investment of 6,667 million euros.

The Recovery, Transformation and Resilience Plan must undoubtedly be a driver for the Spanish economy in general and for activity in our sector. However, since its approval, some obstacles have been encountered that have hindered its implementation and development. The main challenge lies in the management of an unprecedented volume of funds at a time of crisis and uncertainty, coupled with the difficulties arising from the price of raw materials, in particular energy, and their implementation under certain conditions with the achievement of milestones and targets in record time. The pace of investment has been unfolding since 2021, although, as noted above, more slowly than desirable. A much smoother deployment of the Funds is expected this year so that they reach the real economy and boost productive activity and quality employment.

Emerging Technologies

Construction remains one of the least digitised sectors of the economy, although it is undergoing a transformation and is making progress in incorporating digital technologies as one of the solutions to labour shortages, and as a key element to increase competitiveness, energy efficiency and productivity.

The Construction Industry Observatory, in its report The construction sector and information and communication technologies (2023), highlights among the most relevant uses of digital technologies: electronic signature, electronic invoicing, exchange of information by electronic means within the company, use of open source software, cloud computing, big data, internet of things, artificial intelligence, BIM methodology, augmented reality, virtual reality and mixed reality, 3D printing, use of robots, ICT security, e-commerce.

As part of the Erasmus+ **Construction Blueprint** project, companies in 12 European countries were surveyed on the competencies required in digitisation, energy efficiency and circular economy. With regard to digitisation, the results for Spain show that the digital competencies needed by the companies participating in the study to conduct their activities are mostly: the use of CAD software for the production and updating of 2D and 3D drawings, and budgeting with specific software, including BIM (67.7 % and 54.7 % respectively). The results of the same survey show that four out of ten companies interviewed expect to have a very high level in all digital competencies in two years' time.

Main changes affecting

One of the main variables affecting the sector is **public investment**. In the 2010-2020 decade the volume of public investment decreased drastically, with a consequent negative impact on construction and the sector as a whole. The lowest level was recorded in 2012, although the severity of this lack of public investment is a factor that has characterised the entire decade. In 2018-2019 there was a slight increase that could have been the start of a turnaround, but in 2020 the outbreak of the pandemic pushed back public investment in construction to address other priorities at that time.

The lack of an optimal level of public investment in the decade mentioned above has meant that infrastructure projects in different areas that the country needs have not been conducted or have been delayed. The investment deficit has also accumulated in the area of maintenance.

The approval of the Recovery, Transformation and Resilience Plan in 2021 and the arrival of the Next Generation EU Funds have been the trigger for a significant increase in the volume of public investment. However, it should be remembered that these Funds are of a temporary nature; therefore, once the period of application of the Funds is over, it is essential that the Spanish Administration does not let public investment in construction and maintenance fall.

Another indicator is the number of mortgages on dwellings. In 2021, on average, approximately 34,800 mortgages were granted per month. During the 2011-2021 period, 2013 was the year in which the lowest number of mortgages was recorded, with a monthly average of around 16,640.

Shadow economy

The European Commission[3] identifies the shadow economy as a paid activity which, although legal in nature, is not declared to the public authorities. With different nuances, its definition focuses on a weakness in the countries' tax system and is one of the most damaging phenomena as it deliberately hides economic activities. These activities consist mainly of two: undeclared work and under-declaration of income, all in order to avoid part of the tax burden.

Although, as its name indicates, there are no official data that collect this information, there are estimates made by economic analysts that determine its volume in relation to GDP.

According to Scheider, F; Asllani, A (2022) in the case of Spain, the level of the shadow economy compared to other European economies, such as France or Germany, is estimated to be about seven points higher on average. This difference has remained stable throughout the series analysed in this Status Quo. Thus, in Spain, the underground economy represents 15.8 % of GDP.

The coronavirus pandemic caused a recession in almost all countries in 2020, and to a lesser extent in 2021. This led to a sharp rise in unemployment, falling GDP and national income in almost all economies. Compared to 2019, the average increase in unemployment in the EU in 2020 is remarkably high, with 1.7 percentage points higher on average or a two-point increase in the case of Spain, the highest in the last 20 years.

Since 2020, economic policy measures adopted during the pandemic have shown their effectiveness, among others, in reducing the level of the shadow economy in Spain. Two main factors have been identified as drivers of this change: the need to have a legal activity in order to receive the aid that was established to deal with the cessation of activity and the increased use of credit and debit cards as a method of payment replacing cash. All of this has led to an increase in tax revenue in Spain, which will also influence the growth of the Spanish economy by the end of 2022 by more than 5 %. This should be reflected in a clear reduction in the levels of the black economy in all sectors.

[3] García Viña, Jordi (2015) Economía sumergida y relaciones laborales en Europa. Revista Latinoamericana de Derecho Social, no. 21, 31-59. https://www.elsevier.es/es-revista-revista-latinoamericana-derecho-social-89-pdf-S1870467015000172

4.2. Statistics on the construction sector

Developments in residential Construction

According to the Population and Housing Census of 2021 drawn by the National Statistics Institute (INE), published in 30/06/2023, in Spain, there are 18,539,223 households, 455,531 more than in 2011. The total number of dwellings is 26,623,708. The following chart shows the total number of free dwelling units completed between 2011 and 2021.

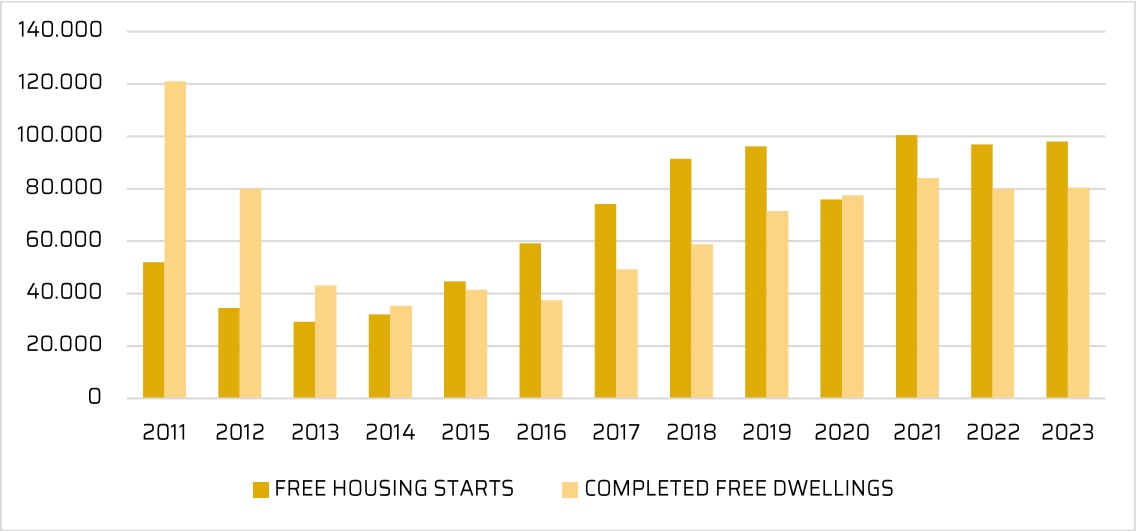


Chart 2. Evolution of dwelling starts and completions. Source: MIVAU

The chart shows the evolution of dwelling starts and completions between 2011 and 2023. After a fall in both categories until 2014, a recovery is observed since 2015, with a notable increase in dwelling starts until 2019. Although dwelling completions are also rising, they are increasing more gradually. In the final years (2021-2023), the numbers of dwelling starts and completions stabilise at around 80,000, reflecting greater stability in the free dwelling construction sector. To put into context the current situation of the real estate sector in Spain, it is worth noting that almost 600,000 free dwelling units were completed in 2006 and currently only around 100,000 are being built.

Developments in non-residential Construction

The following chart shows the non-residential building use from 2017 to 2021.

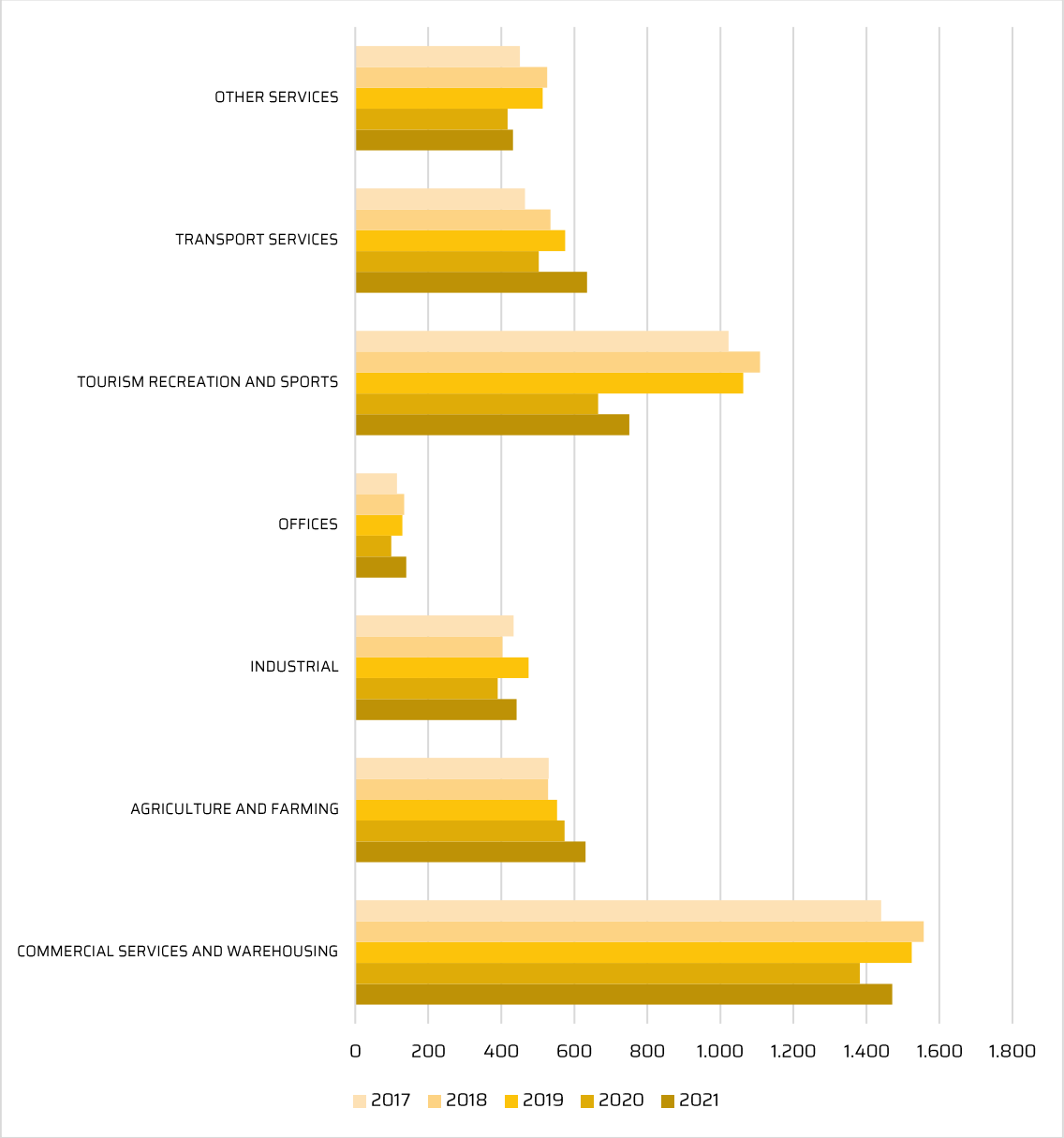


Chart 3. Types of new construction of non-residential buildings. Source: Prepared by the author from data of the MIVAU.

It can be seen from the chart that the type of non-residential new construction in Spain is predominantly in commercial services and warehouses, as well as in works related to tourism, leisure and sports. The time series shows a pronounced decline during the pandemic in new construction for recreational tourism and sports facilities.

Annual ration on rehabilitation, new construction and demolitions

According to national statistics from the Ministry of Housing and Urban Agenda (MIVAU) the ratio of licences involving rehabilitation versus new construction or demolition has been increasing in recent years. Thus, in 2022, 123 rehabilitation licences were issued for every 100 new construction and demolition

licences, while in 2011, 100 rehabilitation licences were issued for every 100 new construction and demolition licences.

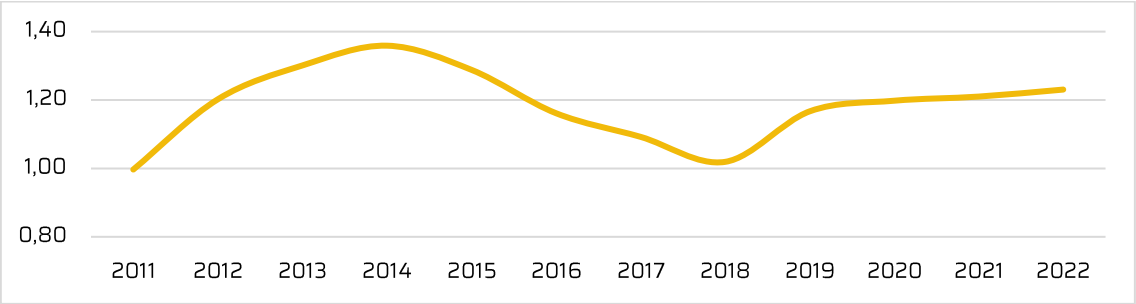


Chart 4. Ratio of rehabilitation licences. Source: Prepared by the author from data of the MIVAU.

Annual consumption of dwellings

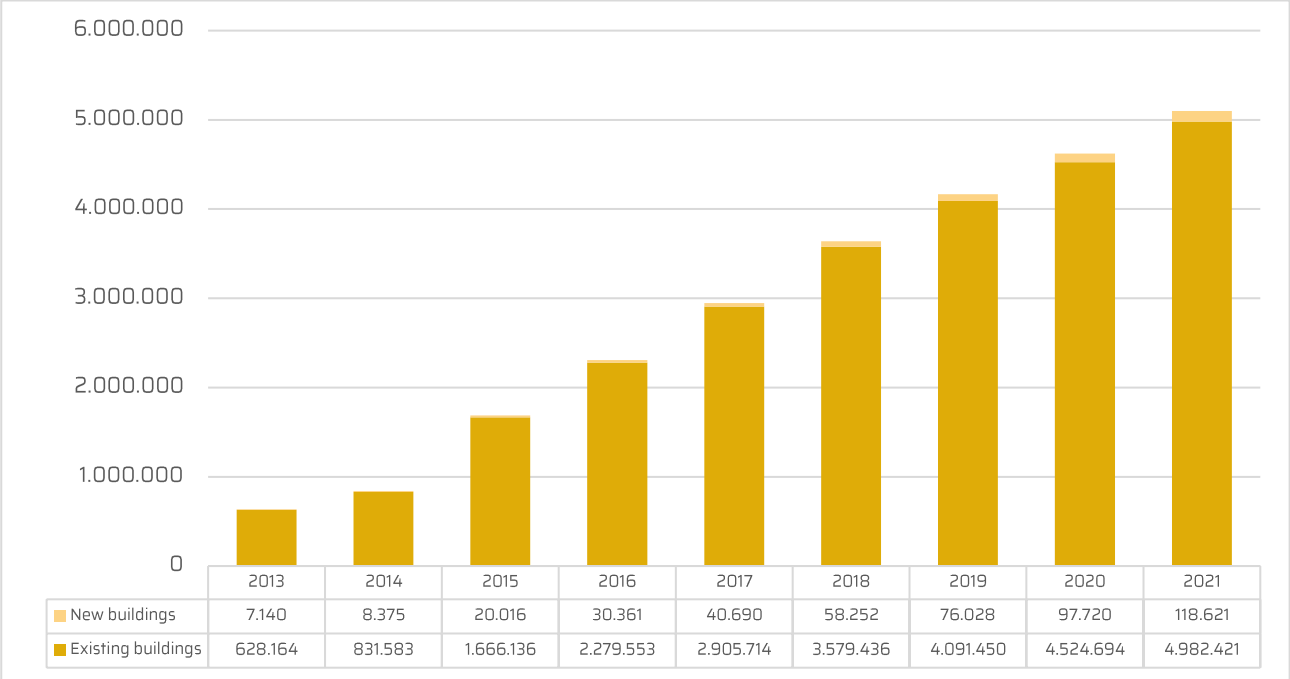
According to available statistics on the electricity consumption of dwellings in a year, in the 2021 Census the electricity consumption in a full year results in 3,837,328 dwellings that are classified as empty, accounting for 14.4 % of the total number of dwellings. For purposes of the 2021 Census, it has been decided to consider as **empty dwelling** that which does not have an electricity supply contract or whose total consumption recorded in the previous year has been less than that which an average dwelling in the same municipality would have if it were occupied for 15 days throughout the year. Thus 14.4 % of dwellings in Spain have an electricity consumption below the minimum threshold. In addition, 3.5 % of households have very low consumption, 9.4 % have sporadic consumption and 72.6 % have regular consumption.

CATEGORY	CONSUMPTION	NUMBER OF DWELLINGS	PERCENTAGE FROM THE TOTAL
Empty dwellings	Below the minimum threshold*	3,837,328	14.4%
Very low consumption	Between minimum threshold* and 250 Kwh	943,924	3.5%
Sporadic consumption	From 251 to 750 kWh	2,514,511	9.4%
Usual consumption	From 751 to 2,000 kWh	7,279,896	72.6%
	From 2,001 to 3,000 Kwh	4,965,393	
	From 3,001 to 4,000 Kwh	3,022,218	
	From 4,001 to 5,000 Kwh	1,649,265	
	More than 5,000 kWh	2,411,173	
Total dwellings		**26,623,708**	**100%**

Table 8. Dwellings according to electricity consumption on 1 January 2021. Source: INE CENSUS, 2021.

Building stock by energy label. Annual rate of new energy efficient buildings and buildings which have undergone energy rehabilitation

The evolution of the number of energy efficiency certificates for four different typologies, according to data from MIVAU and the Ministry for Ecological Transition and the Demographic Challenge, is shown below. The typologies are for new and existing buildings, as well as for residential and tertiary buildings.



	2013	2014	2015	2016	2017	2018	2019	2020	2021
New buildings	7.140	8.375	20.016	30.361	40.690	58.252	76.028	97.720	118.621
Existing buildings	628.164	831.583	1.666.136	2.279.553	2.905.714	3.579.436	4.091.450	4.524.694	4.982.421

Chart 5. Evolution of energy efficiency certificates in new and existing buildings. Source: Annual Accounts registry.

The chart shows a progressive increase in the number of energy certificates issued. In 2021, 4,982,421 certificates were issued for existing buildings and 118,621 for new buildings. Meanwhile, it can be seen below that the majority of energy performance certificates are issued for dwellings. 4,694,536 certificates were issued for dwellings in 2021 while 406,506 were issued in the tertiary sector.

The Ministry for Ecological Transition and the Demographic Challenge provides public information on the energy certification of residential and non-residential buildings and properties on its website.[4]

[4] Ministry for Ecological Transition and the Demographic Challenge. Available at: https://edificioseficientes.gob.es/es

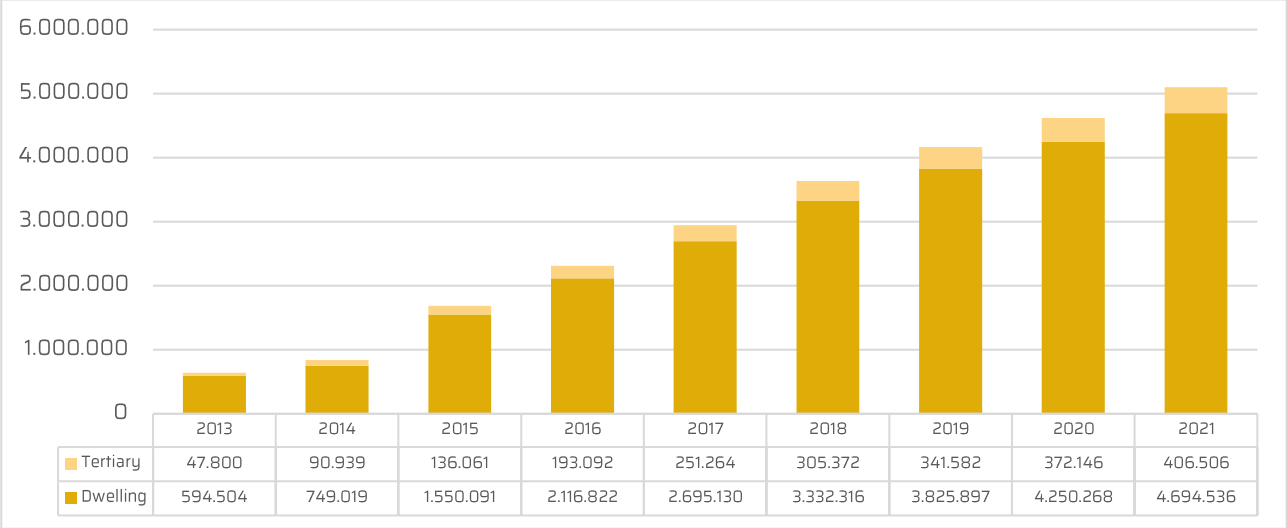


Chart 6. Evolution of energy efficiency certificates in dwelling and tertiary sector. Source: Annual Accounts registry.

Number of companies operating in the construction sector

The sub-sectors of activity that are most related to the research objectives are building construction (412), and the sub-sector of specialised construction activities (43). These sub-sectors account for a total of 322,008 enterprises in 2023, representing 85.4 % of the total volume of enterprises in the construction sector.

Although the real estate development (411) and civil engineering (42) sub-sectors are not strictly related to the project, they are sometimes included in the statistical analyses, as there is no disaggregated statistical information that would allow for more detailed work.

					GROWTH 2012-2023	
CONSTRUCTION SUB-SECTORS	**2020**	**2021**	**2022**	**2023**	**ABSOLUTE VALUES**	**ABSOLUTE PERCENTAGE**
Total	**420,118**	**417,017**	**425,251**	**376,996**	**-43,122**	**1.2**
41 Construction of buildings	**225,067**	**221,106**	**225,111**	**190,031**	**-35,036**	**0.0**
411 Property development	65,229	62,617	63,767	46,820	-18,409	-2.2
412 Construction of buildings	159,838	158,489	161,344	143,211	-16,627	0.9
42 Civil engineering	**11,873**	**11,732**	**11,995**	**8,168**	**-3,705**	**1.0**
421 Construction of roads and railways, bridges and tunnels	1,207	1,163	1,175	1,116	-91	-2.7
422 Network construction	1,150	1,216	1,268	1,241	91	10.3
429 Construction of other civil engineering projects	9,516	9,353	9,552	5,811	-3,705	0.4

CONSTRUCTION SUB-SECTORS	2020	2021	2022	2023	GROWTH 2012-2023 ABSOLUTE VALUES	GROWTH 2012-2023 ABSOLUTE PERCENTAGE
43 Specialised construction activities	**183,178**	**184,179**	**188,145**	**178,797**	**-4,381**	**2.7**
431 Demolition and site preparation	9,494	9,217	9,258	8,492	-1,002	-2.5
432 Electrical, plumbing and other installations on building sites	81,524	81,144	82,041	77,750	-3,774	0.6
433 Building finishes	76,027	76,806	78,538	74,424	-1,603	3.3
439 Other specialised construction activities	16,133	17,012	18,308	18,131	1,998	13.5

Table 9. Table 09. Evolution of the volume of companies in the construction sector by main economic activity. Source: INE (National Statistics Institute). Central Companies Directory (DIRCE)

The evolution of the business structure from 2020 to the present day has represented a significant decrease of 10.3 % in the sector as a whole, caused in the last year. Among the sub-sectors that are most related to the implementation of energy efficiency measures, the number of companies was reduced in less protection. The highest growth is found in the sub-sector of other specialised construction activities (439), which has experienced a 12.4 % growth in the business fabric. The construction sector has reduced its number of companies by **43,122** from the years 2020 to 2023.

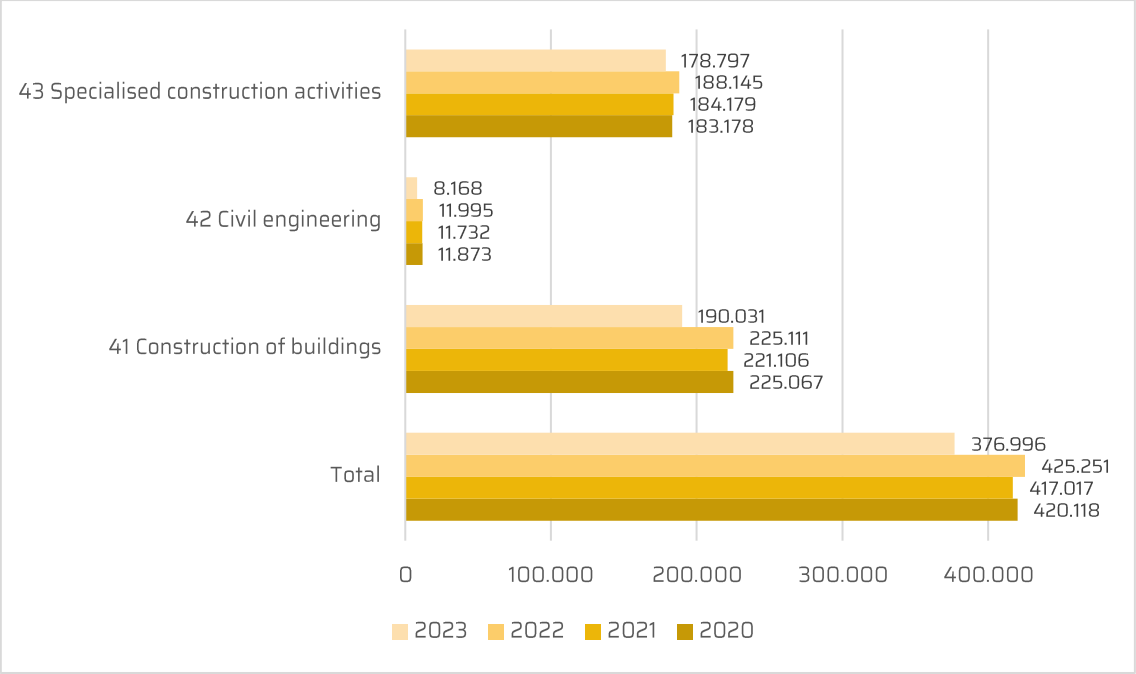
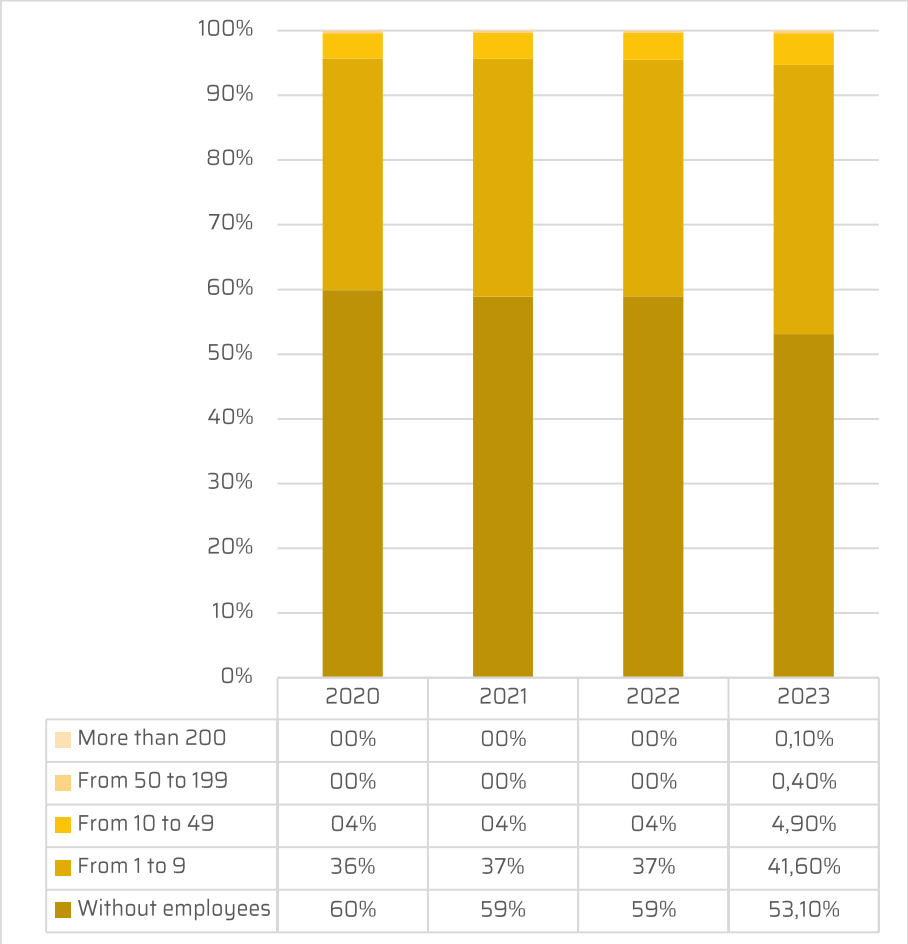


Chart 7. Evolution of the volume of companies in the construction sector by main economic activity. Source: INE Central Companies Directory (DIRCE)

The internal structure of the sector has changed slightly over the last four years. The weight of real estate development (411) has decreased from 15.5 % in 2020 to 12.4 % in 2023, being the sub-sector with the

largest loss of weight in the sector. On the other hand, the weight of building finishing companies (433) has increased in the same period from 18.1 % to 19.7 %.

The majority of firms in the sector have no employees, and the weight of these firms in the total has fallen from 59.9 % in 2020 to 53.1 % in 2023. Small and medium-sized enterprises (1-49 employees) have slightly increased their weight in the sector, from 39.7 % in 2020 to 46.5 % in 2023.



	2020	2021	2022	2023
More than 200	00%	00%	00%	0,10%
From 50 to 199	00%	00%	00%	0,40%
From 10 to 49	04%	04%	04%	4,90%
From 1 to 9	36%	37%	37%	41,60%
Without employees	60%	59%	59%	53,10%

Chart 8. Evolution of the structure of companies in the construction sector by employee stratum. Source: INE (National Statistics Institute). Central Companies Directory (DIRCE)

Small and medium-sized enterprises (SMEs) account for more than 99 % of the sector as a whole and of all the sub-sectors analysed. The proportion of companies with no employees or less than 10 employees constitutes more than 90 % of the companies in all sub-sectors, except for the group of companies mainly engaged in demolition and site preparation and those engaged in other specialised construction activities.

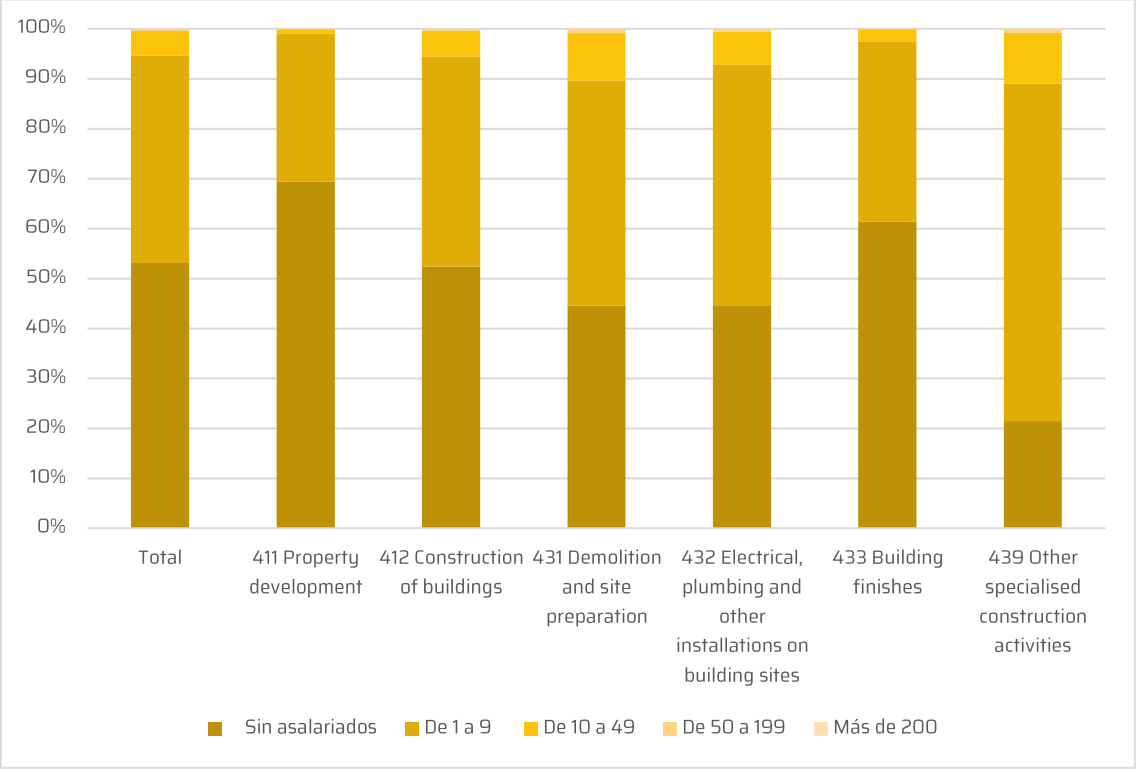


Chart 9. Evolution of the structure of companies in the construction sector by employee stratum. Source: INE (National Statistics Institute). Central Companies Directory (DIRCE)

As regards the legal status of companies, more than half of them are private individuals, increasing from 47.9 % in 2020 to 53.4 % in 2023. The other segment with the most weight in the sector is limited liability companies, which have fallen from 44.8 % in 2020 to 40.8 % in 2023. Public limited companies and other forms of legal organisations have decreased very slightly.

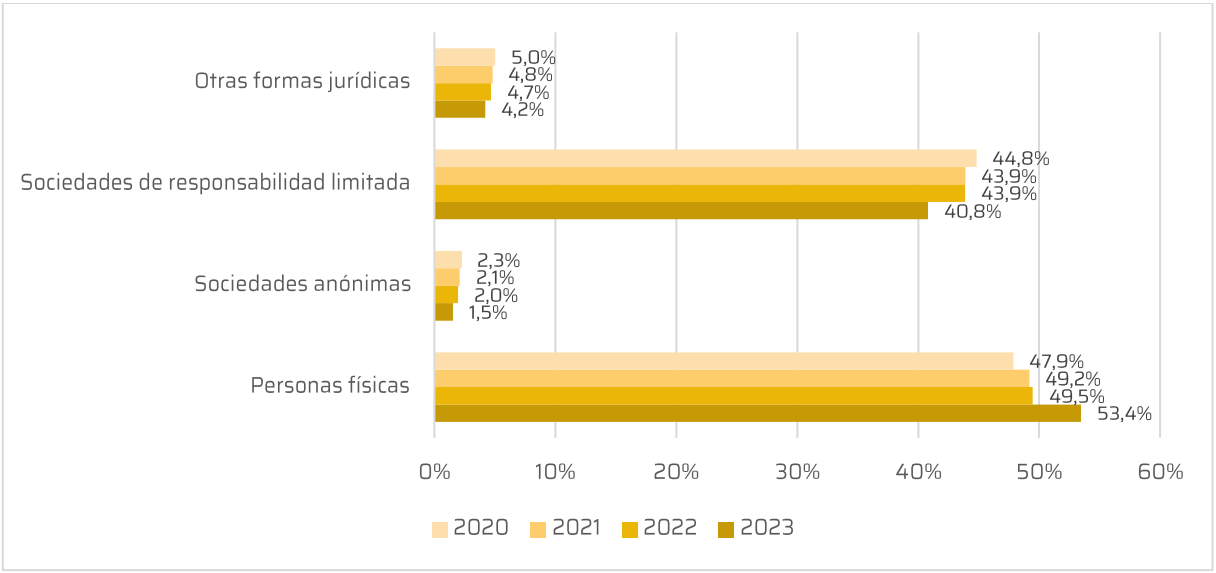


Chart 10. Number of construction companies by form of legal organisation. Source: INE (National Statistics Institute). Central Companies Directory (DIRCE)

4.3. Statistics on the working population in the sector

In 2012, the **working population** in the Spanish economy exceeded 17.6 million people and has experienced a growth of around 3.4 million until 2023, which has meant an annual growth of 19.61 %. The growth in the working population has been general in all production sectors, but construction is the second sector where employment has increased the most, specifically by 17.2 % between 2012 and 2023, with the working population rising from 1,161 to 1.361 million.

						GROWTH 2012-2023	
	2012	2020	2021	2022	2023	ABSOLUTE VALUES	PERCENTAGE INCREASE
Total economy	**17,633**	**19,202**	**19,774**	**20,391**	**21,006**	**3,373**	**19.1 %**
Agriculture	743	765	803	775	743	-0	-0.1 %
Industry	2,484	2,698	2,700	2,771	2793	309	12.4 %
Construction	**1,161**	**1,244**	**1,292**	**1,321**	**1,361**	**200**	**17.2 %**
Services	13,244	14,495	14,979	15,523	16,109	2,865	21.6 %
% employed in construction	6.6	6.5	6.5	6.5	6.2	-0.4	

Table 10. Number of people employed in production sectors. Series 2012-2023. Source: INE (National Statistics Institute). EPA Average of the four quarters of the year.

The percentage of working population in the construction sector as a proportion of all production sectors has fallen slightly since 2012, when it accounted for 6.6 %, to 6.2 % in 2023.

Below is information on the most relevant characteristics of the working population in the construction sector: age, gender, migrant population and level of education.

Working population in the construction sector by age

Since 2013, the retirement age in Spain is rising from 65 to the expected age of 67 in 2027. In the construction sector, the working population amounts to 97,400 people aged 60 and over in 2023, 7.2 % of the total working population in the construction sector. This contrasts with the 58,200 (5.0 % of all construction workers) employed people in the same age group in 2012.

						GROWTH 2012-2023	
	2012	2020	2021	2022	2023	ABSOLUTE VALUES	PERCENTAGE
People under 30 years old	143.9	104.4	117.4	122.1	122.2	-21.7	-15.1%
Between 30 and 39 years old	405.2	270.3	281.7	273.9	283.1	-122.1	-30.1%
Between 40 and 49 years old	343.7	449.8	443.2	461.7	475.3	131.6	38.3%
Between 50 and 59 years old	210.3	337.0	351.4	365.1	383.1	172.8	82.2%
Over 59 years of age	58.2	82.5	97.8	98.3	97.4	39.2	67.4%
TOTAL	**1,161.3**	**1,244.1**	**1,291.5**	**1,321.0**	**1,361.2**	**199.9**	**17.2%**

Table 11. Number of people employed in activity F Construction by age segments. Source: INE (National Statistics Institute). EPA Average of the four quarters of the year.

It is therefore clear that since 2012, the construction sector in Spain has not only lost working population, but also that it is getting older and that there is a shortage of young people entering the sector.

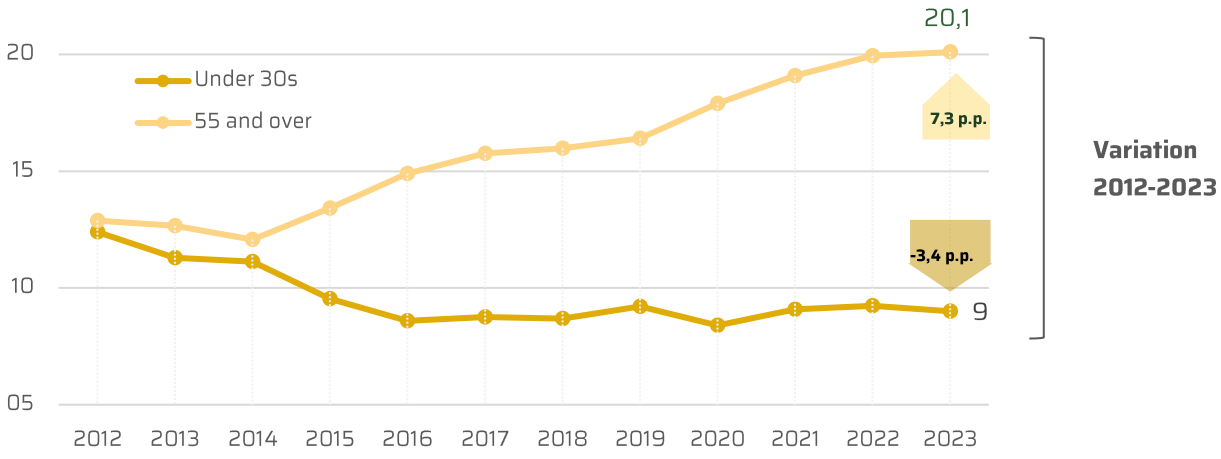


Chart 11. Evolution of the ageing of the construction sector (%). Source: Prepared by the Construction Industry Observatory AND UPDATING with Microdata from the Survey of the Working Population. INE (National Statistics Institute). Note: p. p. (percentage points).

The ageing trend of people in the construction sector is evident. There has been a 67.4 % percentage increase of workers over the age of 59 in the last ten years, and the number of young people entering the sector is decreasing.

The importance of this figure is magnified not only by its number, but also by who it affects: the workers on the construction site: nine of the top ten occupations with the highest number of workers over 59 years of age are construction site workers. In decreasing order, there is:

ORDER		ORDER	
1	Bricklayers, quarry-workers, stonemasons, stone cutters and engravers	6	Construction and mining workers
2	Construction and related trades electricians	7	Supervisors in mining engineering, manufacturing and construction industries
3	Painters, wallpaper installers and related workers	8	Floor layers, parquet fitters and related workers
4	Plumbers and pipe installers	9	Plasterers and paste and mortar coating technician
5	Production managers in agriculture, forestry, fishing, manufacturing, mining, construction, distribution and manufacturing industries	10	Operators of other mobile machinery

Table 12. Occupations by number of workers aged 59+ in 2023. Source: INE.

Working population in the construction sector by sex

Women have increased their presence in the construction sector by 21.8 % from 2012 to 2023, from 8.52 % in 2012 to 8.8 % of the total number of people employed in the construction sector in 2023.

						GROWTH 2012-2023	
	2012	2020	2021	2022	2023	ABSOLUTE VALUES	PERCENTAGE
Man	1,062.4	1,142.2	1,167.9	1,195.8	1,240.7	178.3	16.8%
Woman	98.9	101.9	123.6	125.3	120.4	21.5	21.8%
Total	**1,161.3**	**1,244.1**	**1,291.5**	**1,321.0**	**1,361.2**	**199.9**	**17.2%**

Table 13. Number of people employed in activity F Construction by gender. Source: INE (National Statistics Institute). EPA Average of the four quarters of the year.

It is in civil engineering that women are most represented (13.2 %) and building construction and specialised construction are the activities where women are least represented (8.4 % in both).

According to the latest report published by the Industrial Construction Observatory (2021), the average age of female workers in the sector is 43 years old, most of them have higher education and are of Spanish nationality. The regions of Madrid, Catalonia, Andalusia and the Community of Valencia stand out as the regions with the most women working in the sector.

Working population in the sector by nationality

The presence of foreign workers in the different production sectors was very significant in the first decade of the 2000s in Spain, with the construction sector having the highest proportion of foreign workers in 2008 (24.4 %), which in 2023 stood at 22.9 %.

If the 69,433 workers with dual nationality are also considered, the percentage of foreigners working in the sector rises to 28 %. In the last year, the rate of growth of employment of foreign workers (14.4 %) and those with dual nationality (26 %) contrasts with the fall in the number of employed Spanish nationals in the sector (-1.4 %). By area of origin, European workers account for 26.4 % of the total, while in the previous year they accounted for 36.0 % of the total number of foreigners. In contrast, the Latin American workforce has increased in recent years from 51,800 workers in 2012 to 134,200 in 2023, currently representing 43 % of the total foreign population in the sector.

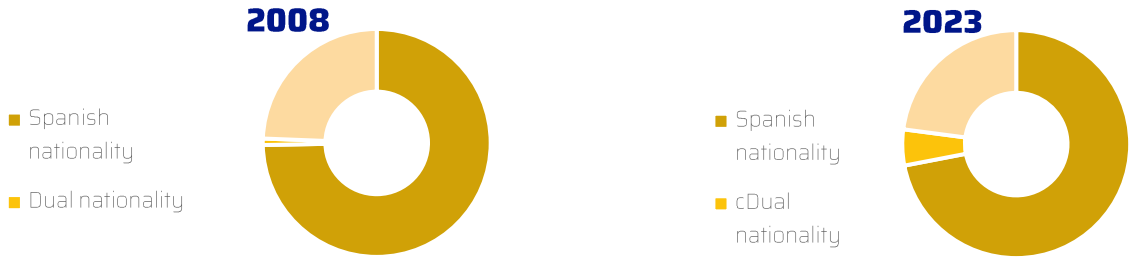


Chart 12. Working population in the construction sector by nationality. Source: compiled by author based on INE data.

Immigration and Emigration in the Construction Sector

Between 2002 and 2023, the population of Spain increased by 6,949,816 inhabitants. Immigration accounts for 61 % of this growth. However, this immigration decreased between 2009 and 2017, falling by 10 % in 2013 and 17 % in 2014 compared to 2009. It seems logical to think that this outflow of foreigners from the country is related to the decrease in job opportunities.

With regard to the construction sector, the working population with Spanish nationality between 2012 and 2020 account for more than 80 % of the total number of workers in the sector. The highest point was reached in 2014, with 86 %, and the lowest in 2023 with 74 % of the working population with Spanish nationality. They are joined by dual nationals in the sector, who accounted for 0.9 % of those employed in the sector in 2008, 1.3 % in 2014 and 4.6 % in 2023.

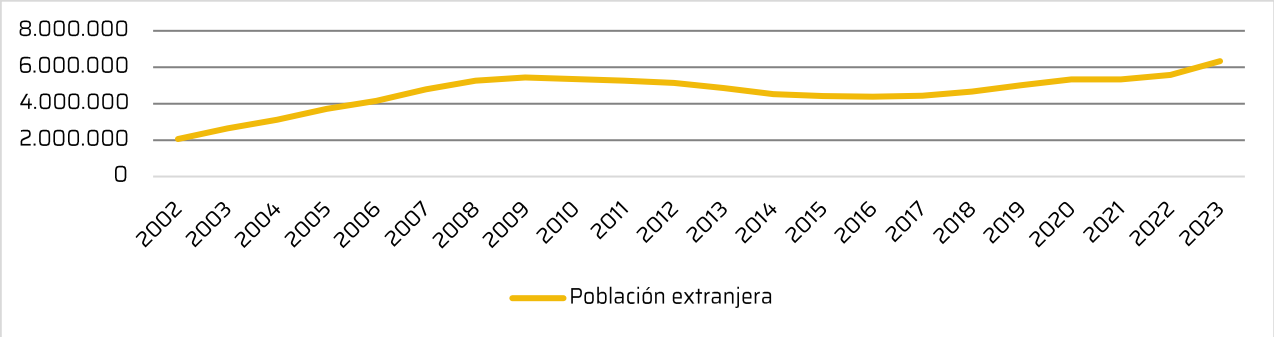


Chart 13. Foreign employed population. Source: compiled by author based on INE.

Working population in the sector and level of education

The occupational structure in the construction sector, compared to the Spanish economy as a whole, is characterised by a higher prevalence of skilled workers. Skilled workers account for 62.58 % of the working population in construction, compared to 10.51 % of all of all employed. Workers in elementary occupations account for 9.29 % and technicians and support professionals for 7.45 %. The occupational structure of the sector in 2023 is similar to that of 2011. The occupational structure has not changed to a large extent since 2011 in the construction sector.

On the other hand, the sector accounts for a low proportion of higher-level occupations, such as technicians and scientific and intellectual professionals. It is also important to note the low proportion of administrative staff.

	CONSTRUCTION		TOTAL	
OCCUPATION	2011	2023	2011	2022
Craftsmen and skilled workers in manufacturing and construction industries (except plant and machinery operators)	60.50%	62.58%	12.40%	10.51%
Directors and managers	4.50%	4.38%	5.00%	4.36%
Accountants, clerks and other office employees	5.50%	5.80%	10.00%	10.36%
Elementary occupations	10.10%	9.29%	13.40%	12.03%
Plant and machinery operators and assemblers	6.40%	4.56%	7.90%	7.91%
Scientific and intellectual technicians and professionals	4.10%	5.66%	16.00%	19.29%
Technicians; support professionals	8.40%	7.45%	10.40%	11.74%
Catering, personal, security, protection and sales workers	0.60%	0.27%	21.70%	21.08%

Table 14. Structure of employment in the construction sector and total employment in Spain. 2011 and 2022/2023. Source: INE (National Statistics Institute). Exploitation of IIT Microdata from EPAs 2011 and the aggregated data from the four EPAs of 2023.

There is a large change in educational attainment in both the construction sector and the total working population, with significant increases in the number of workers with tertiary education and lower proportions of workers with no education or primary education.

In 2023, 52.56 % of those employed in the construction sector have a level of education of first stage of Secondary Education or lower, a figure that contrasts with a much smaller group (29.61 %) among those employed in all economic sectors. More specifically, 43.19 % of the workers in the sector have reached the first stage of secondary education and corresponding training and labour market integration, and 6.91 % have primary education as their highest level of education, while 2.46 % of those in employment have not completed any training at all. On the other hand, in the construction sector 24.01 % of the workers have higher education, while in the economic sectors as a whole it reaches 46.59 %.

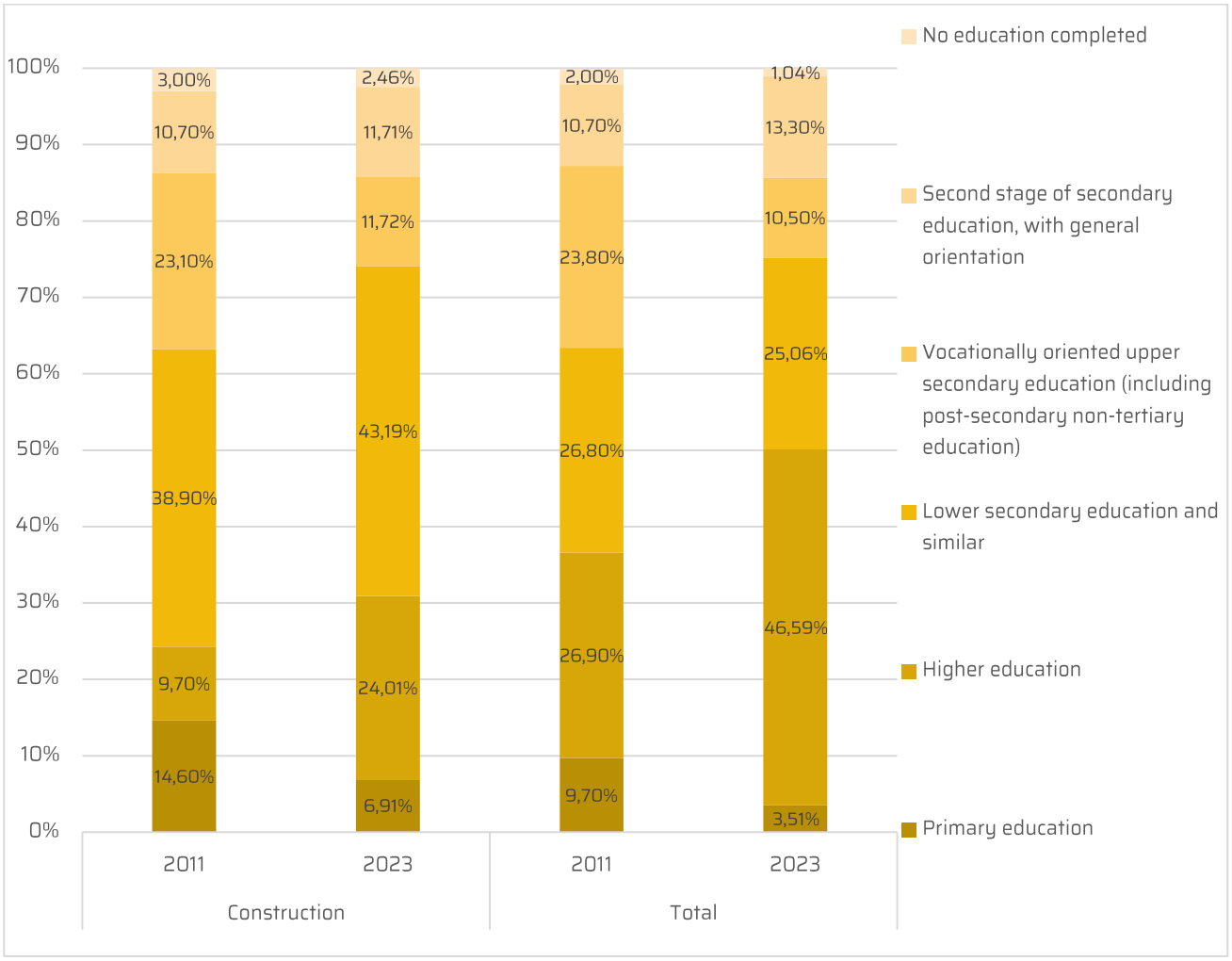


Chart 14. Structure of the educational level of the working population in the construction sector and total employment in Spain. 2011 and 2023. Source: INE (National Statistics Institute). Exploitation of IIT Microdata from EPAs 2011 and the aggregated data from the four EPAs of 2023.

4.4. Statistics on energy consumption and renewable energy in buildings

According to sources from the Institute for Energy Diversification and Saving (IDAE) and the Census for 2021, the following information on energy consumption and renewable energy in Spain has been extracted:

Available energy and total consumption in Spain

The following pictures show the evolution of gross energy available and total final energy consumption, classified by energy sources in the period between 2000 and 2020**:**

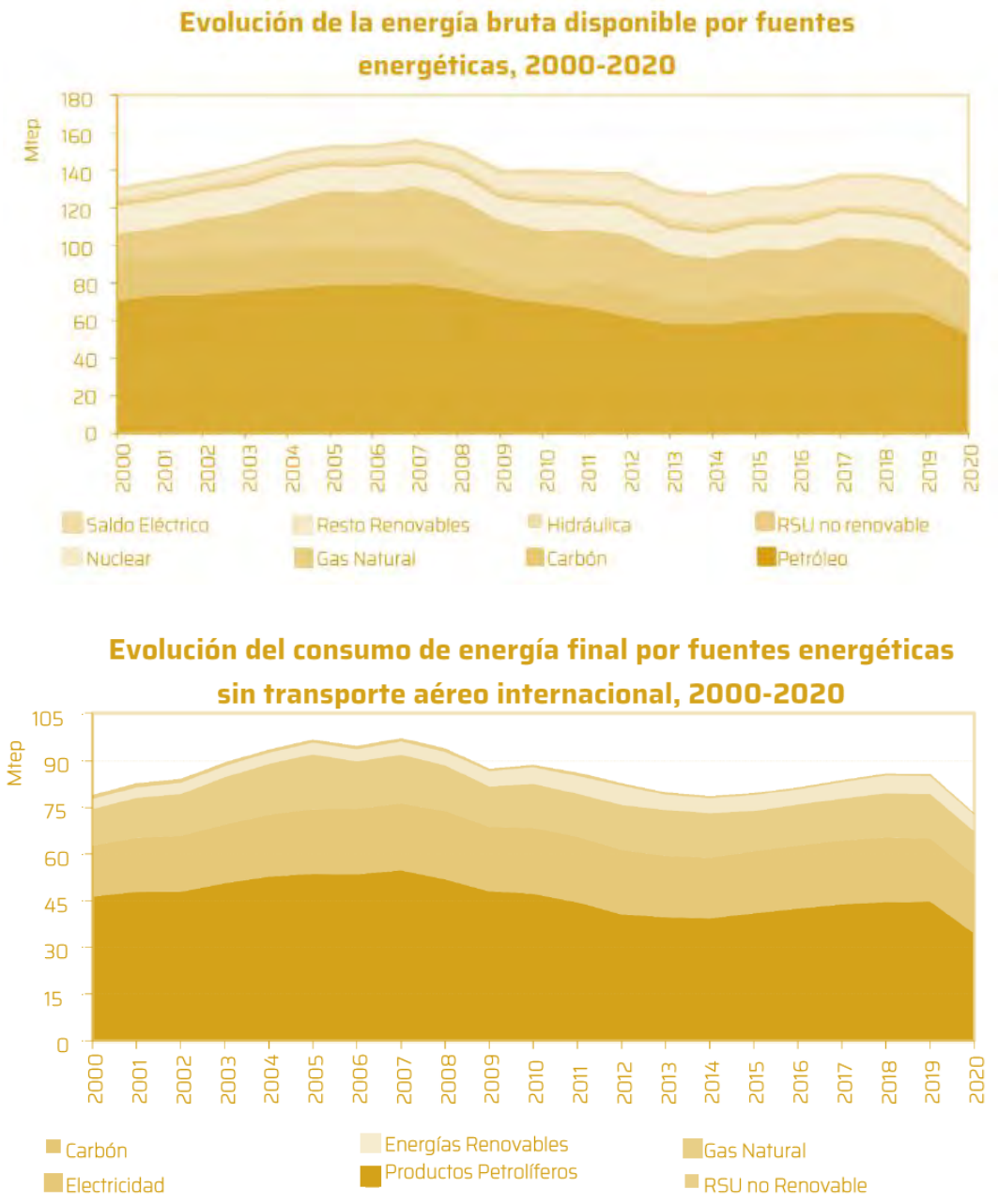


Chart 15. Development of gross available energy by energy source 2000-2020 and Development of final energy consumption by energy source without international air transport 2000-2020. Source: IDAE.

In addition, two periods of increase in both parameters can be observed in the time interval studied: one between 2000 and 2007, and the other between 2014 and 2017-2018.

In terms of energy sources for the gross available energy, contrasting both years, a decrease in the use of oil and coal is mainly observed, while an increase in the use of natural gas and renewable sources is seen.

Focusing specifically on the year 2020, the structure of gross available energy and final energy consumption is broken down as follows:

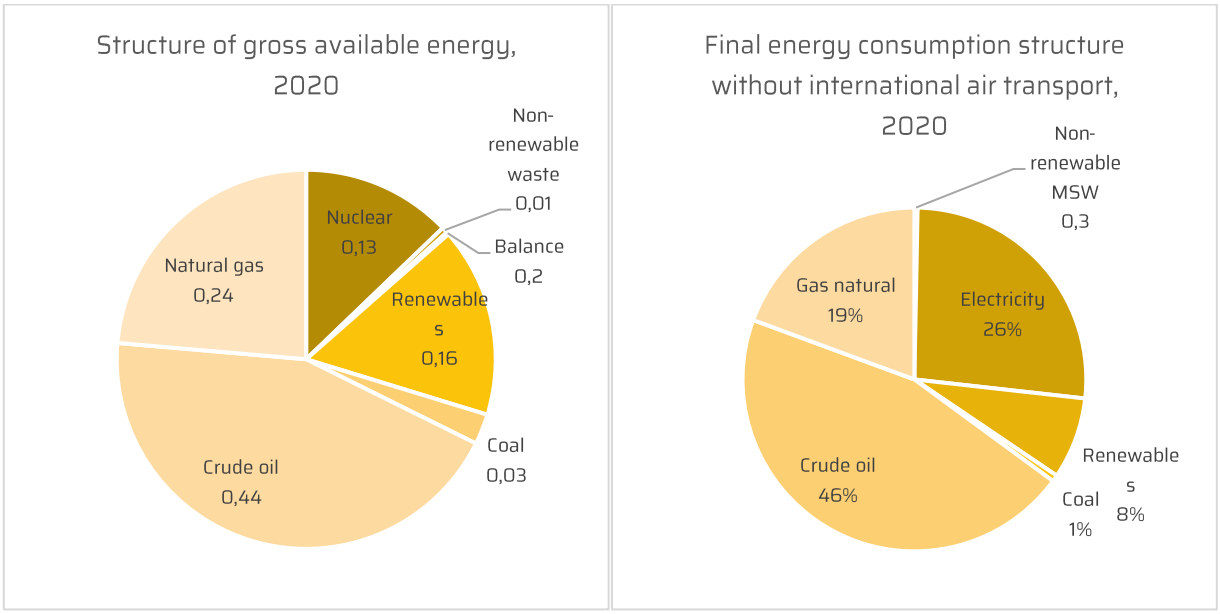
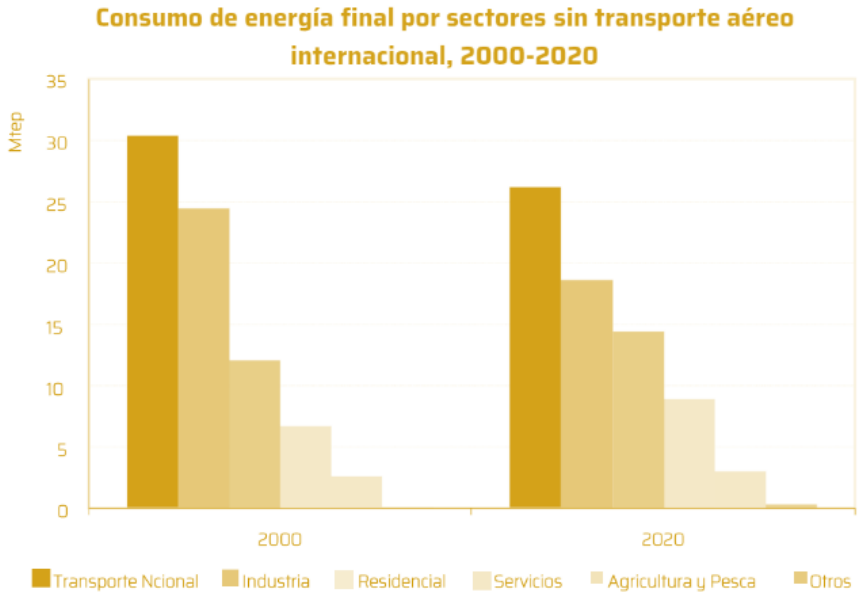


Chart 16. Structure of gross available energy, 2020 and Structure of final energy consumption without international air transport 2020. Source: IDEA.

A predominance of oil as an energy source can be observed both in terms of available gross energy and final energy consumption.

A comparison of final energy consumption by sector between 2000 and 2020 shows a decrease in domestic transport and industry, and an increase in the residential, services and agriculture and fisheries sectors:



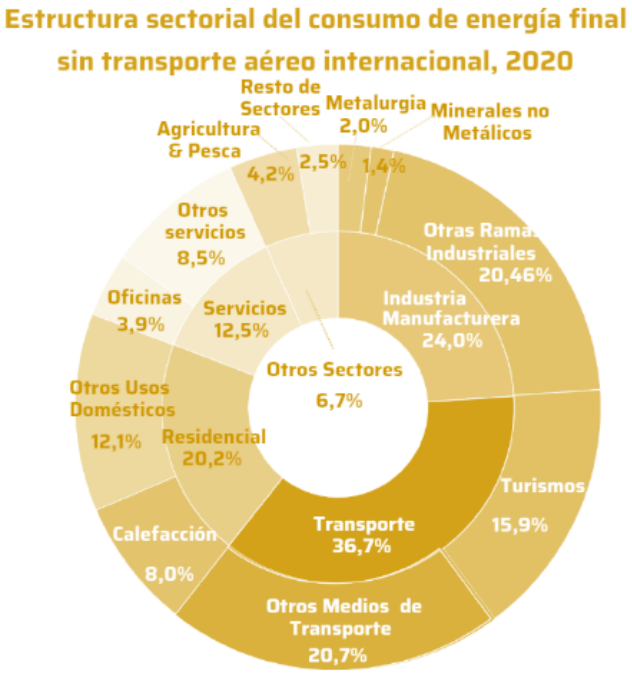


Chart 17. Final energy consumption by sector without international air transport 2000-2020 and Sectoral structure of final energy consumption without international air transport, 2020. Source: IDAE.

It is also noted that in both years, the residential sector was the third largest consumer of energy at the national level. In absolute values, final energy consumption in the residential sector has increased and represents 20.2% of final energy consumption in 2020.

Energy consumption in the residential sector in Spain

The following table summarises some parameters of residential energy consumption for the years 2000 and 2020:

	RESIDENTIAL SECTOR CONSUMPTION [MTOE]	COVERAGE OF ENERGY DEMAND		THERMAL CONSUMPTION PER CAPITA [TOE/PERS]	ELECTRICITY CONSUMPTION PER CAPITA [KWH/PERS]	AVERAGE SURFACE AREA OF DWELLINGS [M²]	AVERAGE OCCUPANCY OF DWELLINGS [PERS/DWEL.]
		RENEWABLE ENERGY [%]	ELECTRICITY [%]				
2000	12.06	22.1	31.1	0.205	1,077	89.04	3.11
2020	14.38	33.57	43.78	0.170	1,543	92.59	2.53

Table 15. Energy consumption in the residential sector in Spain for the years 2000 and 2020. Source: Compiled by author based on IDAE data.

Comparing both years, one can again see an increase in energy consumption in the residential sector, as well as an increase in the coverage of energy demand by renewables and electricity.

Focusing on the evolution of the sector's energy consumption during this period, broken down by end use, it can be seen that, firstly, there was an upward trend until 2010, followed by a slight decrease until 2020. Comparing end-uses between 2000 and 2020, there is mainly a noticeable increase in consumption for appliances and lighting, and an increase in cooling.

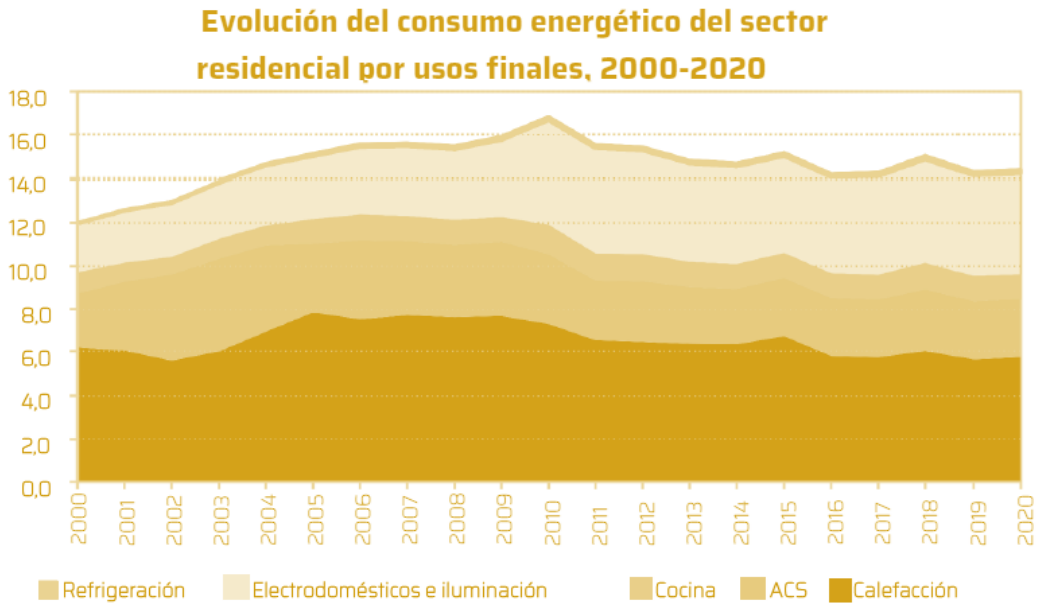


Chart 18. Evolution of energy consumption in the residential sector by end use. 2000-2020 Source: IDEA.

If we also look at the structure of energy consumption in the residential sector by end use, in 2020, we can see that consumption is mainly due to heating, followed by the use of household appliances and domestic hot water (DHW).

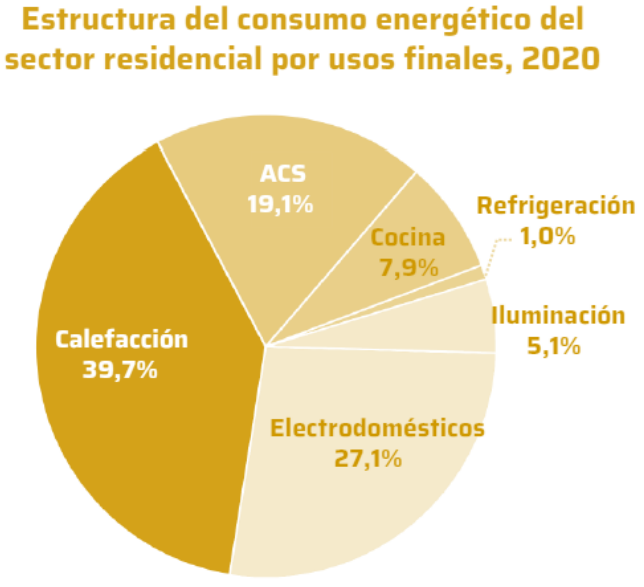


Chart 19. Structure of energy consumption in the residential sector by end use, 2020. Source: IDEA.

However, a comparison of unit consumption by use and surface area between 2000 and 2020 shows a decrease in consumption for heating, but not for lighting and cooling, where there is an increase between the two years analysed.

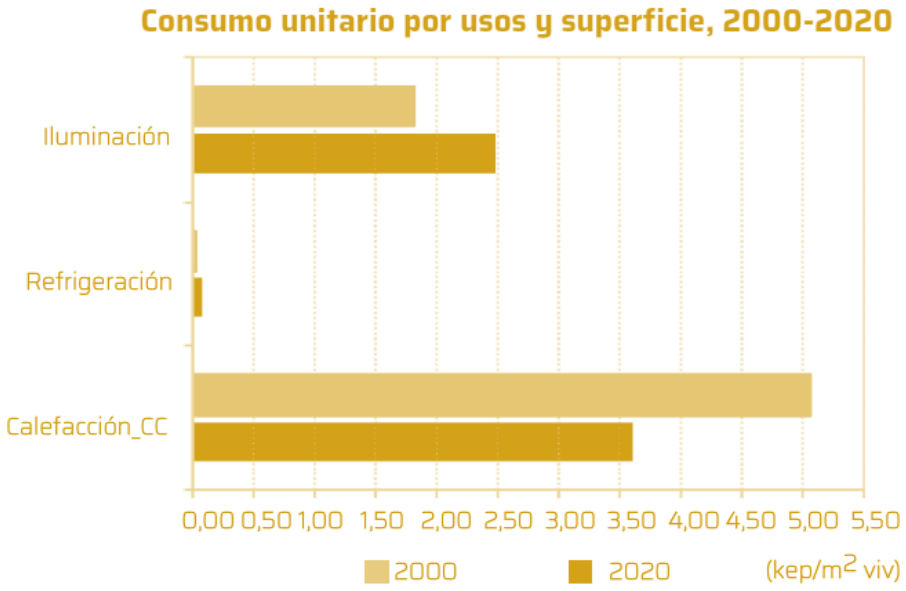


Chart 20. Unit consumption by use and surface area, 2000-2020. Source: IDEA.

It is also interesting to note the significant contribution of renewable sources in terms of heating consumption in 2020:

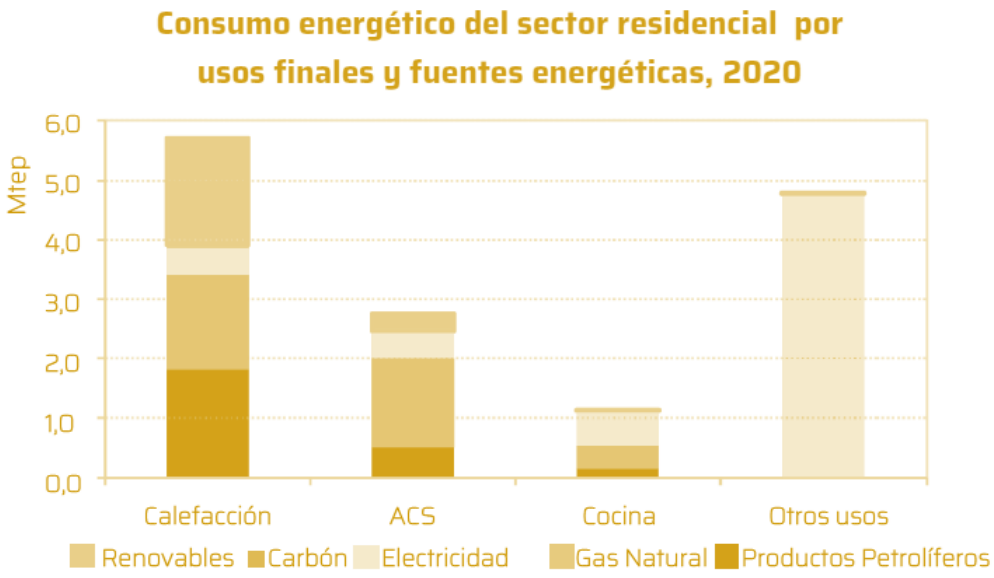


Chart 21. Energy consumption in the residential sector by end use and energy source. Source: IDEA.

Finally, comparing unit consumption by use and by dwelling, again taking the year 2000 and 2020 as reference, a decrease is observed due to cooking and DHW, while an increase is seen in the use of household appliances.

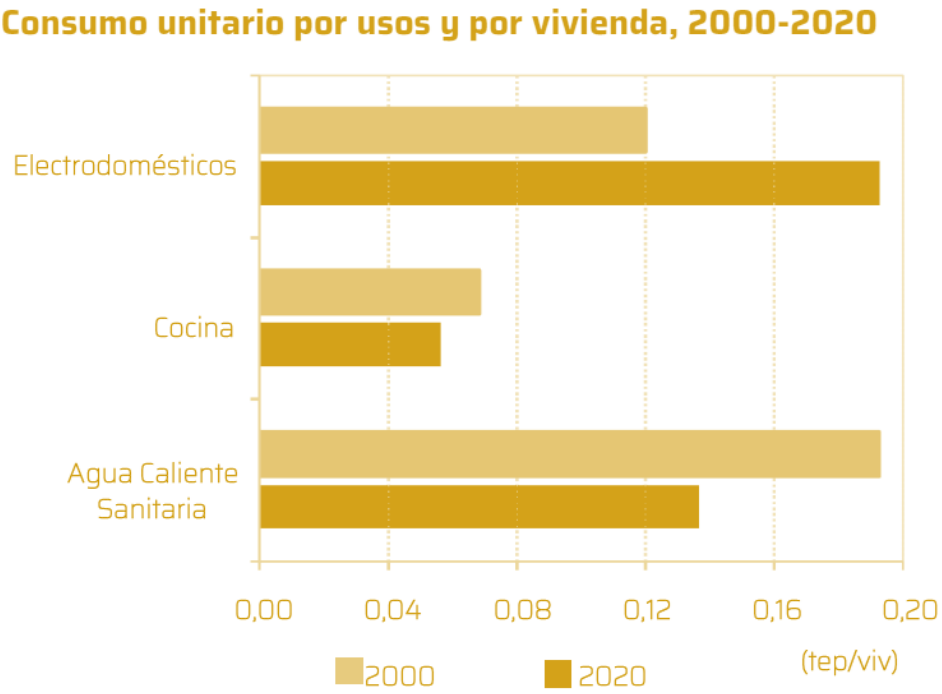


Chart 22. Unit consumption per use and per dwelling, 2000-2020. Source: IDEA.

5. Education system offering and continuing education

Introduction

The energy sustainability targets set by the European Union for 2030 require building workers to acquire new skills or upgrade existing ones. This will require a training effort related to the whole value chain of the construction sector, so it is worth analysing the qualification of integration of skill related to the use of renewable energy, energy efficiency and nearly zero energy buildings in the country's training offer.

This chapter analyses the formation of the education and continuing education system as follows:

- Vocational Education and Training (VET): formal and non-formal training corresponding to EQF levels 1-5 (1-3 pursuant to the Spanish framework). These courses are aimed at specialised operators and middle management (e.g. foremen).

- Provision of the university system: formal and non-formal training corresponding to EQF levels 6-8 (4-5 pursuant to the Spanish framework). These are qualifications whose graduates are those who conduct the activities of design and project development; inspection or construction consultancy of construction systems. In Spain, these are mainly architects, technical architects, and engineers of various specialities.

5.1. Vocational training system for construction workers

5.1.1. Offering of the Vocational Education and Training System

The public training offering is structured around the National System of Qualifications and Vocational Education and Training (NSQVET). The Vocational Education and Training System is made up of an articulated set of actions aimed at identifying the occupational skills of the labour market, ensuring suitable training offers, enabling the acquisition of the corresponding training, recognising occupational skills, and making available to people a vocational guidance and accompaniment service that allows the design of individual and collective training itineraries.

The **National Catalogue of Occupational Skills (NCOE) standards** compiles the most significant occupational skills standards of the Spanish productive system and the associated training, grouped in 26 occupational families and in 3 levels, according to the knowledge, initiative, responsibility and autonomy required by the productive activities.

The Vocational Education and Training system is regulated by Organic Law 3/2022, of 31 March, on the organisation and integration of Vocational Education and Training, and developed through Royal Decree 569/2023 (in the process of development at the time of updating this document).

The law modifies the structure of the vocational training system to enable the acquisition and accreditation of skills. Thus, work is currently underway to enable a person to undertake micro-training, longer qualifications and specialisation courses, on the basis of a training progression, which allows citizens to design and configure their own itineraries adapted to their needs, abilities and expectations.

Responsible Authorities

The authority in the vocational training system is the **Ministry of Education and Vocational Education and Training (MEFP)**, which establishes the basic contents, instruments and mechanisms, without prejudice to the skills that the Ministry of Labour and Social Security (MITES) has recognised in the field of labour.

The **Autonomous Communities** through their Regional Ministries or Departments of Education develop the state regulations and the non-basic aspects of the education system and assume the executive-administrative skills of management of the education system in their own territory given that the skills are transferred. In addition, they can establish up to 35-45 % of VET curricula depending on regional needs.

The main body for participation, advice and evaluation of the Vocational Education and Training System is the **General Council for Vocational Education and Training (**attached to the MEFP), which relies on the participation of business and trade union organisations and a technical support body, the **National Institute for Vocational Qualifications (INCUAL)**, which is responsible for defining, drawing up and keeping the National Catalogue of Vocational Qualifications up to date.

Accreditation and Certification Framework

In Spain, around 10.5 million people still do not have a professional qualification or formal accreditation of their occupational skills. The official accreditation process can be conducted in two ways: through formal training and through official accreditation of occupational skills acquired through work experience or non-formal or informal training.

The second route was regulated in 2009 and modified in 2021 in order to speed up the process and thus increase the number of people with official accreditation of their occupational skills, as well as to meet the validation needs of the different sectors.

One of the aims of these procedures is to enable people's continuing education and the increase of their professional qualification, offering opportunities to obtain a cumulative partial accreditation, with the aim of completing the training leading to the corresponding vocational training qualification or professional certificate.

It is possible to accredit units of skills that are part of a Vocational Education and Training Qualification or a Professional Certificate and if necessary, the training required indicated by the assessment commission can be undertaken to obtain a full qualification.

This chart shows the process:

Figure 7. Skills accreditation process. Source: TodoFP, Ministry of Education and Vocational Education and Training..

Relevant Accreditation Bodies and Training Providers in the Sector

Pursuant to Article 20 of Law 3/2022 on the organisation and integration of Vocational Education and Training, all centres offering Vocational Education and Training System courses must be registered in the General Register of Vocational Education and Training Centres.

In the academic year 2021-2022, there were 3,921 centres in Spain offering Vocational Education and Training cycles, 66 % of which were public centres.

Description of the training offer of the Vocational Education and Training System

In Spain, the profile and qualifications of the person in charge of designing new or refurbishment projects are regulated. Some professions related to the sector, mostly linked to the installation of systems, are also regulated, such as the person who carries out the assembly and maintenance of the building's thermal installations. However, in general, there are no regulations that set out the minimum or compulsory qualifications that professionals conducting construction work must have.

This subsection describes the training linked to the NCPQ, following the structure and nomenclature of the law prior to the current law, given that, as of the date of this document, training has not yet been provided pursuant to the criteria of the new law.

That structure comprised **vocational qualifications** (educational field) and **professional certificates** (labour field before that law). And all these qualifications were grouped into three levels of qualification: basic, intermediate and higher, and by occupational families.

The most closely linked occupational families with vocational training relevant to the energy performance of the building are: Building and Civil Works (EOC by its Spanish acronym), Installation and Maintenance (IMA by its Spanish acronym) and Energy and Water (ENA by its Spanish acronym).

Vocational education qualifications

These are 2,000-hour cycles, generally corresponding to two years of training. All of them include a compulsory internship module in a company towards the end of the course (between 240 and 400 hours).

They can be taken in on-site or online mode, although in the qualifications and certificates analysed, the clearly predominant mode is on-site, which is the one followed in the academic year 2019-2020 by 98% of the graduates of the VET cycles relevant to this report.

As with employment in the sector, women's participation in the vocational qualifications analysed in this report is in the minority. In total, 349 women graduated in 2020, which is 10.70% of the total student body. This is a slight increase from 9.51% in the 2014-2015 academic year.

The VET qualifications that have been analysed for this study are the following:

EQF LEVEL	OCCUPATIONAL FAMILY	QUALIFICATION NAME
3	EOC	Basic-level Professional in Building Renovation and Maintenance.
3	IMA	Basic-level Professional in Manufacturing and Assembly.
3	IMA	Basic-level Professional in Dwelling Maintenance.
4	EOC	Construction Technician.
4	EOC	Interior Works, Decoration and Rehabilitation Technician.
4	IMA	Senior-level Building in Development of Thermal and Fluids Installations Projects.
4	IMA	Heat Production Installations Technician.
5	EOC	Senior-level Technician in Organisation and Control of Construction Works.
5	EOC	Senior-level Building Projects Technician.
5	IMA	Senior Technician in Development of Thermal and Fluids Installations Projects.
5	IMA	Senior-level Technician in Thermal Installations and Fluids Maintenance
5	ENA	Senior-level Technician in Energy Efficiency and Solar Thermal Energy.
5	ENA	Senior Renewable Energy Technician.
5	IMA	Specialisation Course in Building Information Modelling (BIM).

EQF LEVEL	OCCUPATIONAL FAMILY	QUALIFICATION NAME
5	ENA	Specialisation course in Energy Auditing.

Table 16. VET Qualifications analysed for the study. Source: prepared by the authors based on TodoFP data.

Below is the evolution of the data on the total number of graduates of the VET qualifications analysed, compared to the total number of students enrolled in VET:

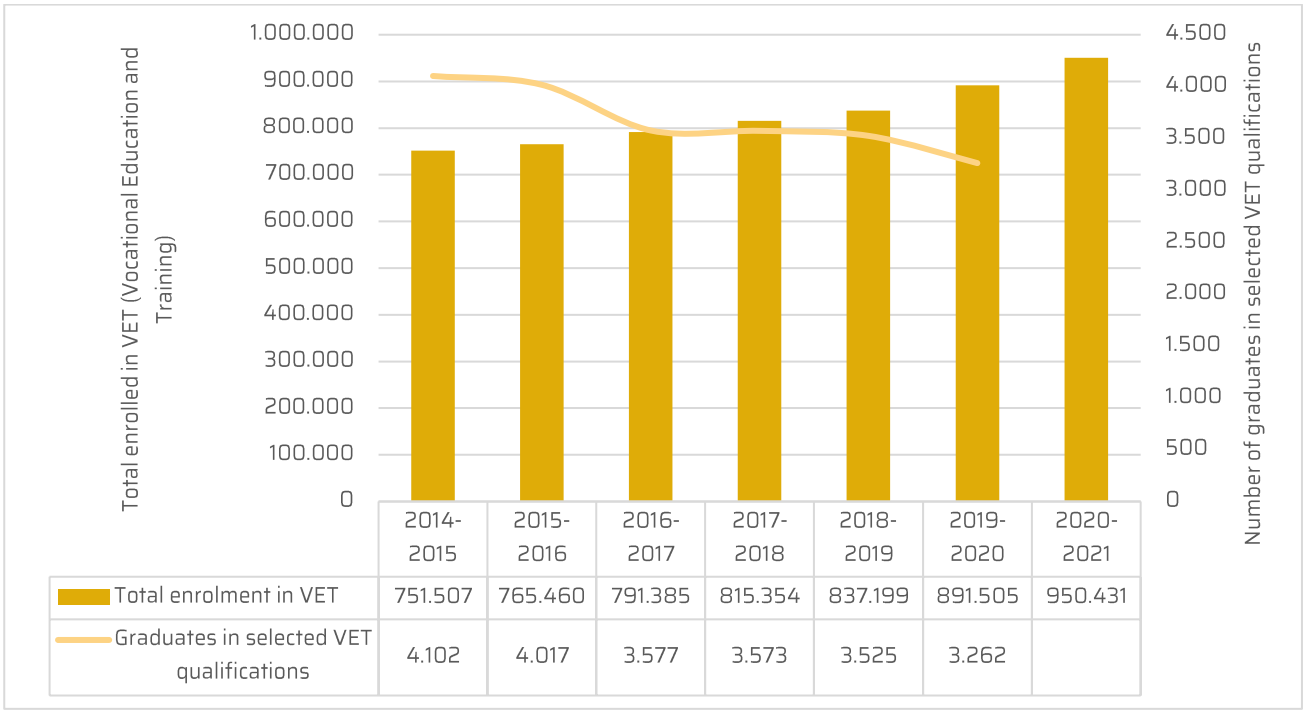


Chart 23. Number of students enrolled in all vocational programmes and number of graduates of the qualifications analysed in this study. Source: Ministry of Education and Vocational Education and Training / EDUCABASE..

From the academic year 2014-2015 to the academic year 2019-2020 (latest published data on the number of graduates), an upward trend can be seen in the number of students enrolled in VET, while the total number of graduates of the qualifications analysed in construction and building has a downward trend. The following pages show the detailed data per qualification: jobs related to the training, the general skills taught, the number of graduates, and the type of institution delivering the qualification.

Basic-level VET Training Cycles

Aimed at people who have not completed Compulsory Secondary Education and who wish to continue their studies towards a field of Vocational Education and Training. These correspond to an EQF level similar to 3 (they are classified at ISCED level 3.5.3) (CINE in Spanish). The student obtains the **qualification of Basic-level Professional and Qualification as Graduate in Compulsory Secondary Education**. In addition, it allows access to intermediate-level training cycles.

Below is a list of the Basic-level VET cycles relevant for professionals that improve the energy performance of the building and therefore related to this report:

OC	BASIC-LEVEL PROFESSIONAL IN BUILDING RENOVATION AND MAINTENANCE
WORK POSITIONS	**GENERAL SKILLS**
Trades: Basic masonry workers. Specialised labourer. Assistant in: bricklaying | paving for urbanisation | flooring | tiling | plastering | plastering | finishing | wallpapering | painting | continuous coatings | basic building maintenance.	Performing ancillary work in construction, new building, refurbishment and renovation works, collaborating in the execution of masonry for cladding, in the application of continuous cladding and in tiling, paving and painting works, operating with the indicated quality, observing the corresponding rules on labour risk prevention and environmental protection.
IMA	**BASIC-LEVEL PROFESSIONAL IN MANUFACTURING AND ASSEMBLY**
Trades: Locksmith | Glazier | Fitter on site. Adjuster-assembler. Plumber/fitter of heating/air-conditioning equipment | Heating/air-conditioning equipment fitter | Heating/air-conditioning equipment maintainer | Water supply and distribution networks installer	Performing basic machining and assembly operations for mechanical manufacturing with ferrous, non-ferrous and techno-plastic materials, as well as for the installation and maintenance of elements of plumbing, heating and air conditioning networks, operating with the indicated quality, observing the rules on labour risk prevention and environmental protection.
IMA	**BASIC-LEVEL PROFESSIONAL IN DWELLING MAINTENANCE**
Trades: Assistant painter / electrician / plumber / plumber assistant / heating / air conditioning fitter assistant Heating and air-conditioning equipment maintenance assistant | Water supply and distribution network installer. Assembler of prefabricated wooden or similar furniture	Performing basic assembly and maintenance operations in plumbing, heating and air conditioning elements; small repairs and replacement of simple elements in electrotechnical installations, in continuous cladding, tiling and painting, as well as assembly and placement of prefabricated furniture and furniture complements of the dwelling, with the indicated quality, applying the rules on occupational risk prevention and environmental protection.

Table 17. Basic-level Vocational Training Cycles. Source: Compilation based on data from the Ministry of Education and Vocational Education and Training.

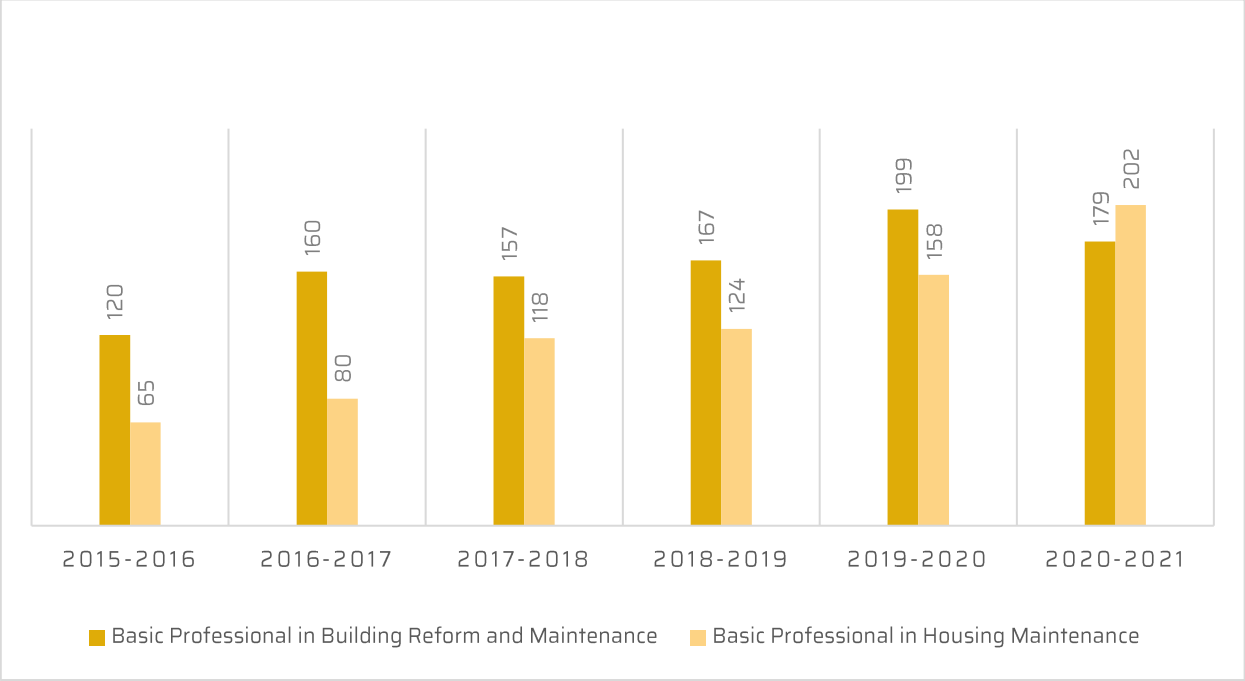


Chart 24. Number of students graduating from basic-level vocational training programmes. Source: Ministry of Education and Vocational Education and Training / EDUCABASE

The most studied basic-level VET qualification is dwelling maintenance with 202 students graduating in the 2020-2021 academic year, followed by the building renovation and maintenance qualification with 179 students. This is a change from previous years when there were more graduates from the building renovation and maintenance qualification. The number of students graduating from basic-level VET programmes has increased in recent years, in both qualifications. Although the role of the basic-level vocational training qualifications analysed is currently testimonial, the trend in recent years is positive.

Most of the basic-level vocational training qualifications analysed are provided in publicly owned institutions, which account for more than 70% of all training institutions.

Intermediate-level Vocational Training Cycles

Intermediate-level vocational cycles are vocational studies belonging to post-compulsory secondary education. They enable the acquisition of technical skills necessary for the effective performance of a profession. They correspond to an EQF level similar to 4 (they are classified as ISCED 3.5.4.).

At the end of the studies, the qualification of **Technician in the profession corresponding to the cycle studied** is obtained. It allows access to Baccalaureate, to the labour market, to other intermediate-level training cycles and to higher-level training cycles.

EOC	CONSTRUCTION TECHNICIAN
Work positions	**General skills**
Team leader. Sights Officer. Trades: Bricklayer, Drywaller, Mason, Paving layer, Sewage network layer, Formwork layer, Iron worker, Roofer, Slate layer, Coating layer, Tiler, Tile layer, Installer of waterproofing systems in buildings, Terrace waterproofer.	The general skills of this qualification consist in executing masonry and concrete works, complying with the established conditions and deadlines, as well as quality, safety and environmental requirements, organising, controlling and assessing the works.
EOC	**INTERIOR WORKS, DECORATION AND REHABILITATION TECHNICIAN**
Team leader and/or manager Trades: Continuous façade cladding applicator | Plasterer | Floor tiler | Plasterboard and false ceiling fitter | Plasterboard joint fitter | Layer of light prefabricated construction products | Layer of light flooring | Carpet fitter | Installer of raised access floors | Installer of partition systems and technical panelling systems | Painter and/or wallpaperer | Painter and/or wallpaperer	Organising and executing construction finishes in new construction, refurbishment and rehabilitation, conducting floors, partitions and ceilings, by means of the installation of panels or prefabricated pieces, the placement of plates or sheets, the application of continuous coatings and the painting of surfaces, complying with the established conditions and deadlines, as well as with the quality, safety and environmental prescriptions.
IMA	**TECHNICIAN IN REFRIGERATION AND AIR CONDITIONING INSTALLATIONS**
Refrigeration fitter in commercial installations / in industrial processes | Refrigeration maintenance in commercial installations / in industrial processes. Installer/fitter of air-conditioning, ventilation-extraction, distribution networks and terminal equipment. Maintenance and repair of air-conditioning, ventilation-extraction, distribution networks and terminal equipment.	Assembling and maintaining refrigeration, air conditioning and ventilation installations, applying current regulations, quality, safety and occupational risk prevention protocols established, ensuring their functionality and respect for the environment.
IMA	**HEAT PRODUCTION INSTALLATIONS TECHNICIAN**
Installer/maintainer of heat production equipment / heating and DHW installations / solar thermal installations / water installations / gas and liquid fuel installations.	Assembling and maintaining heating, solar thermal and fluid installations, applying current regulations, quality, safety and occupational risk prevention protocols established, ensuring their functionality and respect for the environment.

Table 18. Intermediate-level Vocational Training Cycles. Source: Compilation based on data from the Ministry of Education and Vocational Training.

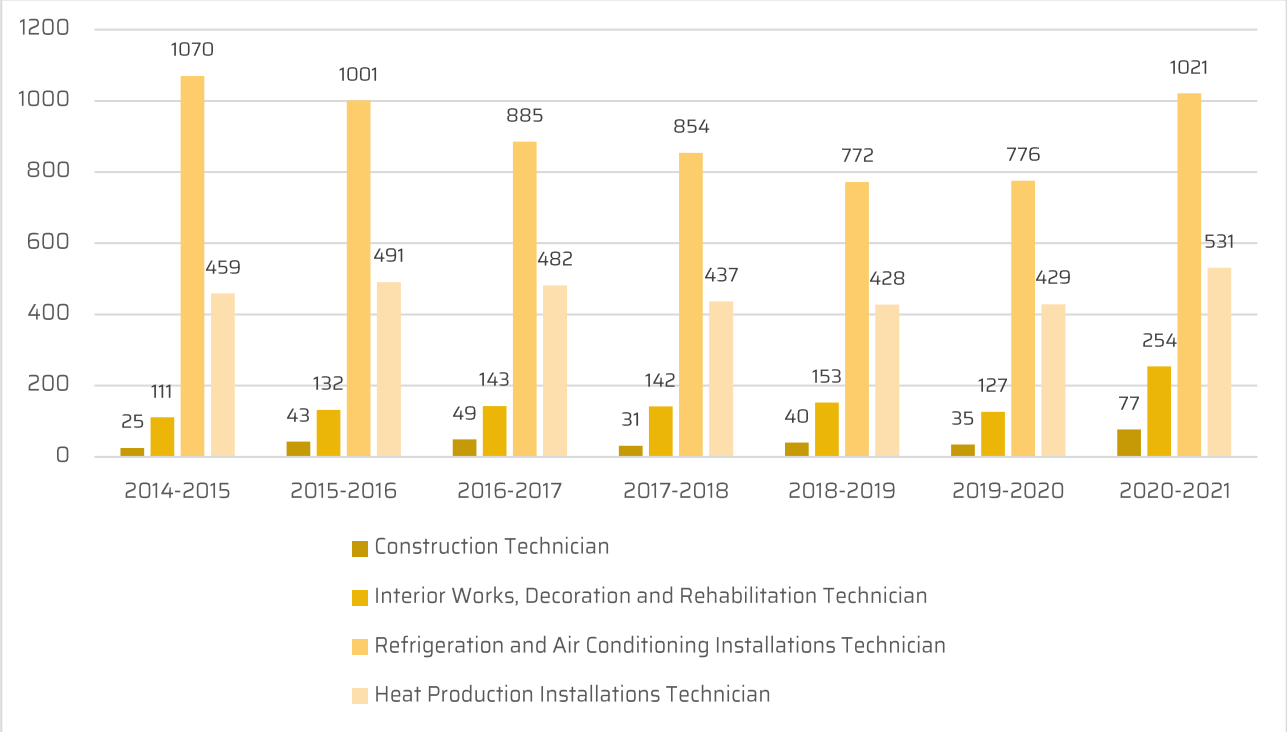


Chart 25. Number of students graduating from intermediate vocational training programmes. Source: Ministry of Education and Vocational Training / EDUCABASE.

The most sought-after intermediate-level vocational training qualification is refrigeration and air conditioning technician (1021 students graduating in the 2020-2021 academic year), followed by the qualification in heat production installations (531 students), interior design, decoration and renovation technician (254 students), and construction technician (77 students). Overall, the number of intermediate-level VET graduates has slightly decreased in recent years.

As in the case of the basic-level qualifications, most of the centres offering the intermediate-level qualifications identified in this report are public: 78.3 % of the qualifications in the Building and Civil Engineering occupational family and more than 86.4 % and 89.7 % of the qualifications in the Installation and Maintenance family.

Ciclos Formativos de FP Grado Superior

The Higher-level VET Cycles are occupational studies belonging to higher education. They allow acquiring the essential technical skills required to develop a profession, to adapt to present and future work situations, as well as to acquire coordination and planning responsibilities in certain professions.

They correspond to an EQF level similar to 5 (They belong to ISCED level 5.5.4.). At the end of the studies, the Qualification of **Higher-level Technician** in the profession corresponding to the cycle studied is obtained and allows access to the labour market and also access to university studies. In addition, they are assigned a number of **ECTS credits,** which facilitate the recognition of credits in university degrees.

EOC	SENIOR-LEVEL TECHNICIAN IN ORGANISATION AND CONTROL OF CONSTRUCTION WORKS
Work positions	**General skills**
Foreman and team leader: Structural works | Building works | Rehabilitation and refurbishment works | Workshop | Building finishing works Assistant to the Head of the Technical Office | Planner | Cost Controlling Technician Foreman | Documentary control technician. | Specialist in staking out	Organise, on site, building and civil works execution works, managing resources, coordinating works and controlling work units, in accordance with project specifications, work planning, instructions received, applicable regulations and the conditions established in terms of quality, safety, occupational health and the environment
EOC	**SENIOR-LEVEL BUILDING PROJECTS TECHNICIAN**
Draughtsman: Building designer | Building | Installations Assistant to: Head of Technical Office | Planner | Cost Control Technician | Building Energy Certification Processes Construction model maker Documentary control technician Stakeout specialist. Building energy efficiency technician	Drawing up the technical documentation for building projects, conducting the layout of the work and managing the documentary control for its execution, respecting the regulations in force and the established conditions of quality, safety and the environment
IMA	**SENIOR-LEVEL TECHNICIAN IN THERMAL INSTALLATIONS AND FLUIDS MAINTENANCE**
Draughtsman for heating installations / air-conditioning and ventilation-extraction installations / refrigeration installations / fluid distribution networks and systems. Technician in heat installation planning / in air-conditioning and ventilation-extraction installation planning / in refrigeration installation planning / in process planning of fluid distribution networks and systems installation	Developing projects and planning the assembly of thermal and fluid installations in buildings and industrial processes, pursuant to the established regulations and standards, following quality, safety, occupational risk prevention and environmental respect protocols
IMA	**SENIOR-LEVEL BUILDING IN DEVELOPMENT OF THERMAL AND FLUIDS INSTALLATIONS PROJECTS**
Planning and programming of maintenance processes for thermal and fluid installations. Team leader of fluid distribution networks and systems assemblers/maintainers. Industrial refrigeration / air-conditioning and ventilation-extraction / fluid distribution networks and systems / heating installations / maintenance of ancillary production facilities Refrigeration and heating and DHW installer. Heating and DHW maintenance. Thermal installation assembly supervisor. Head of the heat installations maintenance team	Planning, managing and supervising the assembly and maintenance of thermal and fluid installations in buildings and industrial processes, pursuant to the established regulations and standards, following quality, safety, occupational risk prevention and environmental respect protocols

ENA	SENIOR-LEVEL TECHNICIAN IN ENERGY EFFICIENCY AND SOLAR THERMAL ENERGY
Energy efficiency of buildings. Building energy certification process assistant. Commercial of solar installations. Responsible for the assembly and maintenance of solar thermal installations. Energy manager: Developer of energy efficiency programmes.	Evaluate the efficiency of energy and water installations in buildings, providing technical support in the process of energy qualification and certification of buildings, and configure solar thermal installations, managing their assembly and maintenance in conditions of safety, quality and respect for the environment
ENA	**SENIOR RENEWABLE ENERGY TECHNICIAN**
Developer of solar installations. Project designer for photovoltaic solar installations. Responsible for the assembly and maintenance of photovoltaic solar installations. Assembler/operator of photovoltaic solar installations. Operator-maintenance technician of electrical substations for wind and photovoltaic installations	Coordinating the assembly, commissioning and management of the operation and maintenance of wind farms and installations, developing installations, developing projects and managing and conducting the assembly and maintenance of solar photovoltaic installations and managing and supervising the assembly and maintenance and conducting first-level operation and maintenance in electrical substations

Table 19. Higher-level VET Training Cycles. Source: Compilation based on data from the Ministry of Education and Vocational Education and Training.

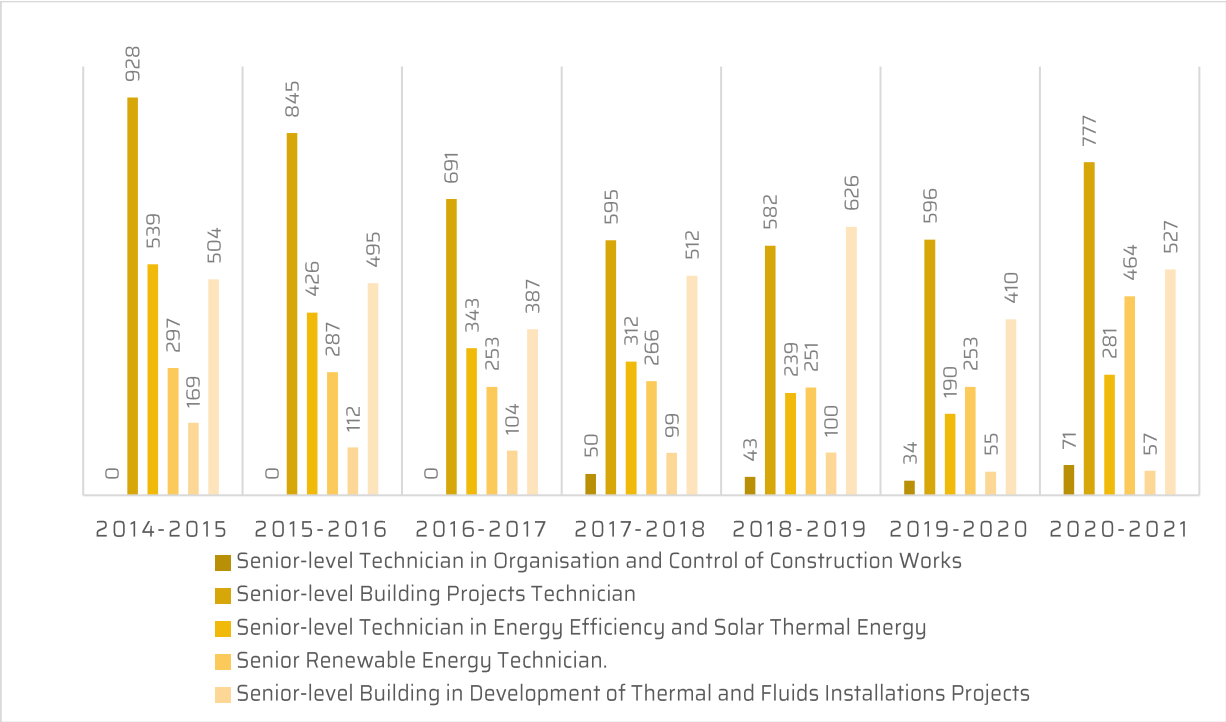


Chart 26. Number of students graduating from higher-level VET programmes. Source: Ministry of Education and Vocational Training / EDUCABASE.

The most studied higher-level VET qualification is the higher-level qualification in building projects (777 students graduated in the 2020-2021 academic year), followed by the higher-level technical qualification in maintenance of thermal and fluid installations (527 graduates). Other less studied qualifications are

Senior-level Technician in renewable energy (464 graduates), Senior-level Technician in energy efficiency and solar thermal energy (281 graduates), Senior-level Technician in organisation and control of construction works (71 students), and Senior-level Technician in development of thermal and fluid installations projects (57 students). The number of graduates in higher-level VET programmes as a whole has declined in recent years, as has the number of graduates in intermediate-level VET programmes as noted above. However, there has been a significant upturn in the last academic year for which data are available.

Continuing with the trend of the basic and intermediate levels, the number of public centres is clearly higher than the number of private centres also teaching higher-level qualifications, highlighting that 96.2% of the centres that teach the Senior-level Technician in Organisation and Control of Construction Works qualification are public. The qualification with the highest presence of private centres is the Senior-level Technician in Energy Efficiency and Solar Thermal Energy (24.6 %).

Specialisation VET courses

VET specialisation courses aim to provide a rapid response to innovations in the production system and in emerging fields. They allow to deepen and broaden the knowledge and skills acquired during the intermediate or higher level. They have a duration of between 300 and 600 hours, and are also assigned a number of **ECTS credits,** which enable the recognition of credits in university degrees.

These studies lead to the **qualification of Specialist** (if the course is an Intermediate-level Course) or **Master's Degree in VET** (if the course is a Higher-Level Course). They correspond to an EQF level similar to 5 (they are classified at ISCED level 5.5.4.).

IMA	SPECIALISATION COURSE IN BUILDING INFORMATION MODELLING (BIM)
Work positions	**General skills**
BIM Modeller. BIM Modelling Coordinator	Develop and model the graphic and non-graphic information of Architecture, Engineering and Construction projects under the BIM methodology in its different dimensions, and collaborating in the project processes, respecting the client's requirements (EIR, Employer's Information Requirements) and the prescriptions established in the BIM Execution Plan (BEP, Building Execution Plan), among others.
ENA	**SPECIALISATION COURSE IN ENERGY AUDITING**
Energy audit manager. Energy auditor. Technician in energy audits in mechanical installations, air conditioning and heating, electricity and lighting. Technician in energy audits in buildings | thermal installations	Auditing and advising on energy use and consumption and associated costs in buildings, industrial or commercial facilities or operations, transport linked to private or public activity or service, with the aim of identifying and reporting on energy flows and their potential for improvement.

Table 20. Specialisation VET courses. Source: Compilation based on data from the Ministry of Education and Vocational Training.

Both degrees are newly created (2021 and 2022), so it is not possible to include student data. In relation to the type of centres offering these qualifications, in the case of the Specialist Course in Building Information Modelling (BIM), there are 15 public and 1 private training centres. In the case of the Specialisation Course in Energy Auditing, no data is currently available.

Professional Certificates

Professional Certificates regulated by Royal Decree 34/2008, of 18 January (until the implementation of Organic Law 3/2022, of 31 March, on the organisation and integration of Vocational Education and Training), comprise training actions aimed at the acquisition and improvement of occupational skills and qualifications. Professional certificates are modular in nature with the aim of favouring the accumulative partial accreditation of the training received and enabling the worker to progress in their vocational training itinerary whatever their employment situation at any given time.

Each Professional certificate accredits a professional qualification of the NCPQ. The training modules of the professional certificate correspond to those of the Modular Catalogue of Vocational Education and Training.

The professional certificates related to the object of this Status Quo are the following:

EQF LEVEL	OCCUPATIONAL FAMILY	QUALIFICATION NAME
3	EOC	EOCB0209 Ancillary operations of rigid finishes and urbanisation. 340 hours
3	EOC	EOCB0109 Ancillary operations of continuous cladding in construction. 440 hours
3	AGA	AGAO0108 Ancillary activities in nurseries, gardens and garden centres. 330 hours
4	EOC	EOCB0111 Pitched roofs. 650 hours
4	EOC	EOCJ0111 Waterproofing using sheet membranes. 590 hours
4	EOC	EOCJ0110 Installation of plasterboard and false ceilings. 550 hours
4	EOC	EOCB0211 Urbanisation paving and masonry. 490 hours
4	EOC	EOCB0110 Decorative painting in construction. 640 hours
4	EOC	EOCB0311 Industrial painting in construction. 600 hours
4	EOC	EOCB0210 Pastes and mortar coatings in construction. 670 hours
4	ENA	ENAE0108 Assembly and maintenance of photovoltaic solar installations. 540 hours
4	ENA	ENAE0208 Assembly and maintenance of solar thermal installations. 580 hours
4	ENA	ENAE0111 Basic operations in the assembly and maintenance of renewable energy installations. 540 hours
4	ENA	ENAE0508 Organisation and projects of solar photovoltaic installations. 630 hours

EQF LEVEL	OCCUPATIONAL FAMILY	QUALIFICATION NAME
4	ENA	ENAS0110 Assembly, commissioning, maintenance, inspection and overhaul of gas reception installations and appliances. 540 hours
4	ENA	ENAT0108 Assembly and maintenance of water networks. 450 hours
4	MAM	MAMR0108 Assembly of furniture and carpentry elements 460 hours
4	IMA	IMAR0208 Assembly and maintenance of air-conditioning and ventilation-extraction installations. 500 hours
4	IMA	IMAI0110 Installation and maintenance of thermal insulation, acoustic insulation and passive fire protection systems 620 hours
4	IMA	IMAR0408 Assembly and maintenance of heating installations 500 hours
4	ELE	ELEE0109 Assembly and maintenance of low-voltage electrical installations 920 hours
4	ELE	ELEM0111 Assembly and maintenance of domotic and inmotic systems 480 hours
4	AGA	AGAO0208 Installation and maintenance of gardens and green spaces 470 hours
5	EOC	EOCO0112 Control of execution of building works. 750 hours
5	ENA	ENAC0108 Energy efficiency of buildings. 920 hours
5	ENA	ENAE0308 Organisation and projects of solar thermal installations. 630 hours
5	ENA	ENAA0109 Organisation and control of the assembly and maintenance of water and sanitation networks and installations. 510 hours
5	IMA	IMAI0210 Management and supervision of the assembly and maintenance of thermal, acoustic and fire insulation systems. 620 hours
5	FME	FMEC0208 Design of boilermaking and metallic structures 660 hours
5	AGA	AGAJ0109 Management and maintenance of ornamental trees and palms 510 hours
5	AGA	AGAJ0109 Management of the installation and maintenance of turf in sports grounds 520 hours
5	ELE	ELEE0610 Management and supervision of the assembly and maintenance of low voltage electrical networks and outdoor lighting. 620 hours
5	ELE	ELEM0211 Management and supervision of the assembly and maintenance of home and building automation systems. 550 hours

Table 21. Professional certificates. Source: Compilation based on data from the Ministry of Education and Vocational Education and Training.

The new Law on Vocational Education and Training (Ley de Formación Profesional) restructures the vocational education and training system, linking the VET system in education and employment. However, pursuant to the second transitory provision of Organic Law 3/2022, "the academic organisation of the Vocational Education and Training courses of the Education System and the organisation of the professional certificates in the field of Vocational Education and Training for employment will remain in

force until the regulatory development is conducted within the framework of the new Vocational Education and Training System".

Below is a table of the new structure dictated by the new VET Law:

VOCATIONAL EDUCATION AND TRAINING (VET) OFFERING FORESEEN IN THE NEW LAW FOR THE ORGANISATION AND INTEGRATION OF VET					
Level	**Grade A**	**Grade B**	**Grade C***	**Grade D***	**Grade E***
1	Partial accreditation of skills	Skills Certificate of competence	Professional certificate	Basic-level Technician	
2				Specialised technician	Specialist
3				Senior-level Technician	Professional Master

Table 22. Vocational Education and Training foreseen in the New Law for the Organisation and Integration of VET. Source: Author's compilation based on data from Law 3/2022 on the organisation and integration of vocational education and training.

** It must include a phase of training in a company or similar organisation, from which those who can prove work experience that corresponds to the occupational studies undertaken may be exempted.*

5.2. Vocational education and training for employment

The training actions within the Employment Training System in the field of employment are structured through the **Catalogue of Training Specialities,** published by the State Public Employment Service (SEPE) in order to respond to the training needs of the labour market. This Catalogue includes the organisation of all the training offer developed within the framework of the Vocational Education and Training System for employment in the work environment.

Training Specialisations are attached to an occupational family and to qualification levels and can train for a set of work activities or in cross-sectoral transversal skills.

The regulations governing the Vocational Education and Training System for employment are mainly composed of the following, without prejudice to other applicable regulations and provisions.

1. Law 30/2015, of 9 September, which regulates the Vocational Education and Training System for employment in the field of employment.

2. RD 694/2017, of 3 July, implementing Law 30/2015.

3. Order TMS/283/2019, of 12 March, which regulates the Catalogue of Training Specialities within the framework of the vocational education and training system for employment in the work environment.

Accountable Authorities and Governance

Pursuant to the Law, 30/2015 which regulates the Vocational Training System for employment in the work environment. In Spain, governance is conducted by the **Ministry of Labour and Social Economy** and the **State Public Employment Service (SEPE)** which, together with the Public Employment Services of the Autonomous Communities, form the National Employment System.

The State Foundation for Training at Work (FUNDAE) supports the Ministry of Employment and Social Economy in strategically implementing the vocational education and training system at work and is a collaborating agency of SEPE in planning, programming, managing, assessing and following up and controlling the state training initiatives.

Framed within the scope of FUNDAE, the **Sectoral Joint Committees (CPS)** are part of the governance structure. They define the Sectoral Reference Plan that includes the training specialities of the SEPE's Catalogue of Training Specialities considered to be a priority for each sector, and which can be financed in the calls for subsidies. These reference plans are reviewed and updated at each call and new training specialisations are created if they are deemed necessary for the sector.

There are currently a total of 90 sectoral joint commissions, including the Construction Sectoral Joint Commission, which is relevant to this report and is made up of the Confederación Nacional de la Construcción (CNC), CCOO del Habitat and the Federation of Industry, Construction and Agriculture of the General Workers' Union UGT-FICA.

The Joint Construction Commission, in its Sector Reference Plan 2022, has identified and defined the training specialities and occupational certificates that are considered a priority for the construction sector and which may be eligible for public funding through the different training initiatives framed within the VET system for employment.

Description of the training offer

There are different training initiatives that target unemployed workers to improve their employability and employed workers to improve their skills:

1. The **training programmed by companies** for their employees or "on-demand" training. These are the training actions that, according to its needs, the company programmes for its employees.

2. Training offer for **employed workers** or **"offer" training**, aimed at covering the needs not covered by the training programmed by the companies for their workers.

3. Training offer for **unemployed workers**, which is adjusted both to the individual needs of the worker and to the needs of the productive system.

4. **Individual Training Permits:** is the authorisation granted by a company to an employee to conduct a training action that is recognised by means of an official qualification or accreditation.

5. **Training combined with employment**, this training is a mixed process of employment and training that allows the worker to combine formal learning with occupational practice in the workplace. Dual training is included in this section

Below are the data on participation in training provided by employed workers in the sector (supply-side training) and in training organised by companies in the sector (demand-side training), both of which are financed by public funds. The data are broken down by years of training and areas of training within the scope of the Construction Sectoral Joint Committee.

All the training actions provided belong to the Construction Sector Reference Plan, although only the participants in training actions related to the scope of this study have been selected.

The chart below shows the data on the training provided to employed workers in the construction sector through public training calls, known as "supply" training. It shows the number of participants trained in the training actions delivered between 2018 and 2021, grouped by the training areas considered most relevant for this study.

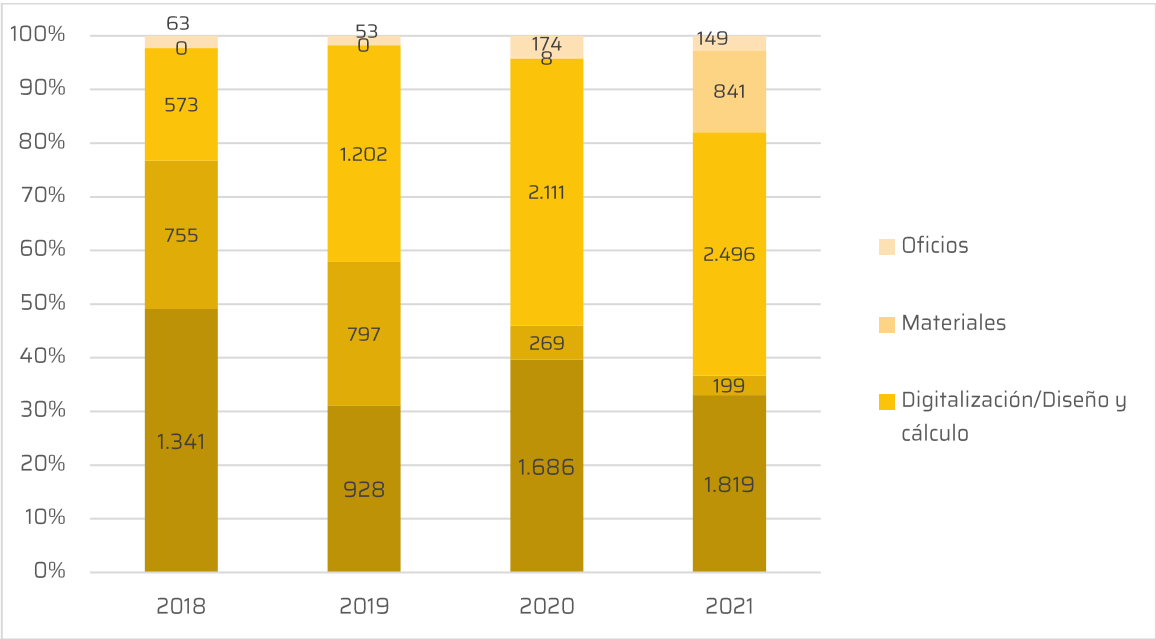


Chart 27. Number of participants in training programmes offered, grouped into different topics. Source: FUNDAE.

In turn, the following chart shows the data on the training programmed by construction companies for their employees, also known as "demand" training. This shows the number of participants trained in the training actions delivered between 2018 and 2021, selected and grouped by the areas of interest considered most relevant for this study.

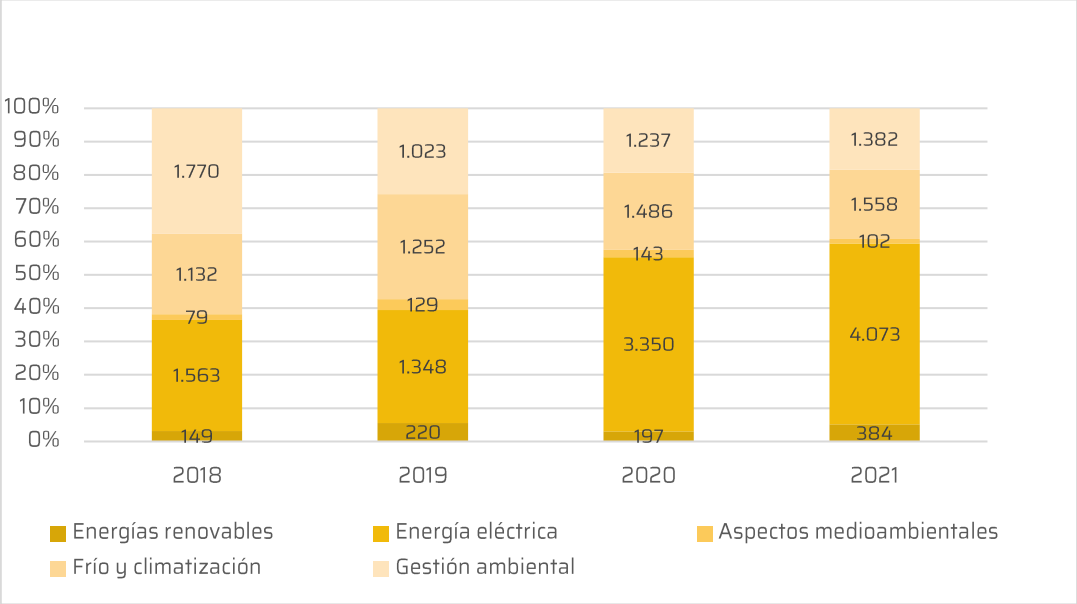


Chart 28. Number of participants in demand training, grouped by training areas. Source: FUNDAE.

5.3. Higher education system

The higher education system is regulated by Organic Law 2/2023 of 22 March on the University System. It is made up of Bachelor's, Master's and Doctorate degrees, and, on the other hand, in the articulated in the own degrees.

Responsible Authorities

The Spanish Constitution endows universities with legal status and they perform their duties under an autonomous. The authorities responsible for the higher education system are:

- The **General Conference on University Policy**: without prejudice to the duties attributed to the university coordination bodies of the Autonomous Communities, it is the body for cooperation and coordination of university policy between the different Public Administrations.

- The **University Council**: is the academic coordination body of the Spanish university system, as well as the body for cooperation, consultation and proposals in university matters. It is attached to the Ministry of Universities and has the following functions, which it performs with full functional autonomy:

- The **State University Student Council** is the body for participation, deliberation and consultation of university students before the Ministry of Universities.

Relevant Accreditation Bodies and Training Providers in the Sector

University studies are offered in public universities and in private universities recognised as such by the Administration. The Spanish University System is made up of 86 universities: 50 public and 36 private.

The on-site university has university centres and other units in 177 municipalities.

The competent bodies of the Autonomous Community grant the authorisation to open a university, which, pursuant to the regulation, must have plans that guarantee gender equality in all its activities, measures to correct the salary gap between women and men, accessibility conditions and reasonable adjustments for people with disabilities, and measures to prevent and respond to violence, discrimination or harassment covered by Law 3/2022, of 24 February, on university coexistence.

On the other hand, the National Agency for Quality Assessment and Accreditation and the rating agencies of the Autonomous Communities registered in the European Quality Assurance Register (EQAR) accredit and evaluate university teaching staff, evaluate university degrees, and monitor and report on results at university level.

Number Of Courses/Year

While collar professionals with responsibility for the work are regulated by Law 38/1999 on Building Regulations: project designer, project manager, project execution manager, who must have completed a degree in architecture, technical architecture, engineering or technical engineering, depending on the type of building to be constructed.

University Bachelor's degrees

University Bachelor's degree studies are aimed at providing students with basic and general training in a specific discipline. They are coincident with EQF level 6.

TECHNICAL ARCHITECTURE / DEGREE IN BUILDING CONSTRUCTION (240 ECTS)	
Work positions	**General skills**
In general, technical profiles involved in the entire life cycle of a building. Areas: 1. Construction Execution Management 2. Real Estate Sector 3. Risk Prevention in Building 4. Sustainability in Building 5. Energy Efficiency in Buildings 6. Realisation of Building Projects 7. Building Rehabilitation	Developing works projects provided for by law Management of works provided for by law Reports, opinions, expert opinions, valuations, appraisals, energy certification, among others. Health and safety coordination during the project's design and implementation Energy Management (LEAN, BREEAM, PASSIVHAUS seals, etc.) Environmental and Waste Management Energy Manager, Environmental Management Plan, Construction Waste Management Plan.

BACHELOR'S DEGREE IN ARCHITECTURE	
Work positions	**General skills**
Architect, Urban planner, Interior architect Foreman Health and Safety Coordinator Project Manager Project design draughting Design and calculation of installations Design and calculation of structures Expert in Building Rehabilitation Energy Certifier Realisation of ITES (Technical Inspection of Buildings) Estate Expert Energy Efficiency Expert Fire Safety Expert Home automation Expert Expert in lighting technology Expert in Acoustics	Design and management of all kinds of building works Drafting of all types of urban planning instruments and their execution projects. Demarcation and measurement of land. | Valuation of land and buildings | Interior and exterior decoration of buildings | - Administration of funds: management of works promotion | Demolition of buildings. | Development of facility layouts | Conservation of buildings and monuments | Legalisation files

Table 23. Official University Degree in architecture and technical architecture. Source: Prepared by the author based on data from the Ministry of Universities.

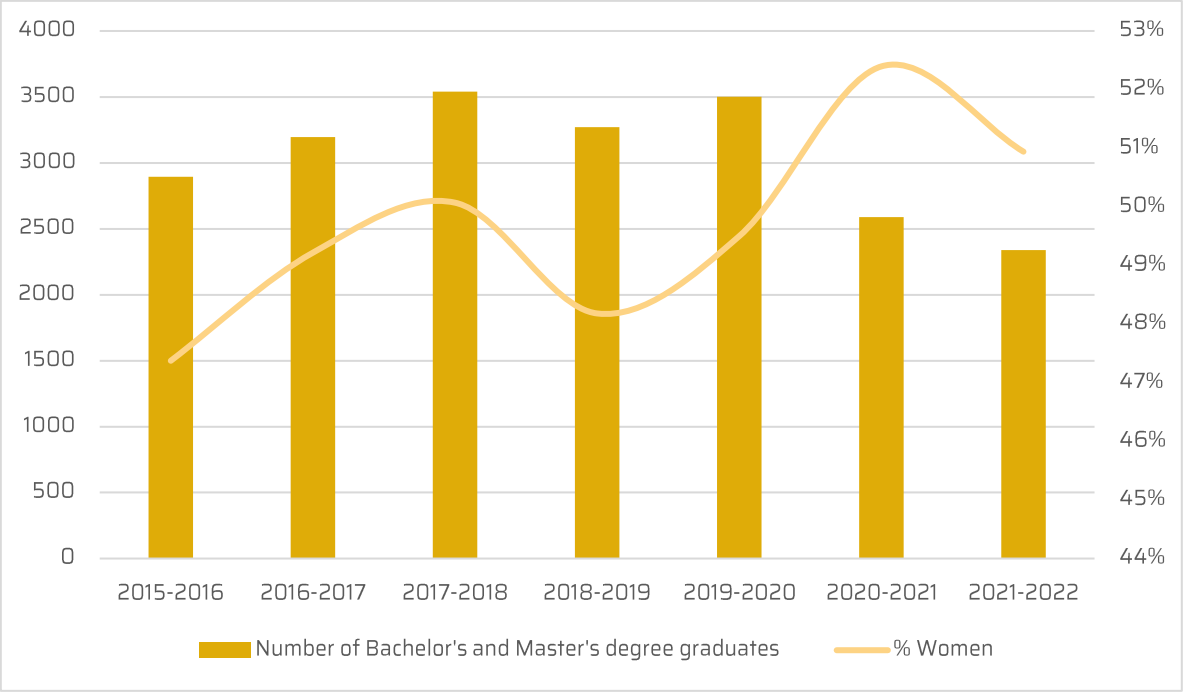


Chart 29.Number of graduates in Technical Architecture and Architecture degrees, by year. Source: Ministry of Universities.

University master's degrees

University Master's degrees are academic or occupational specialisation courses. Equivalent to EQF level 7. Each university regulates its own master's degrees. Pursuant to the latest data published by the

Ministry of Universities, there are more than 150 Master's degrees in the field of architecture and engineering related to building, with a purely architectural or sustainability character. Below is a chart showing the number of graduates in the last five years according to the field of the Master's degree studied.

NUMBER OF GRADUATES							
Scope of the master's degree	**2015-2016**	**2016-2017**	**2017-2018**	**2018-2019**	**2019-2020**	**2020-2021**	**2021-2022**
Water	62	44	36	53	31	34	36
Architecture	563	913	1,291	1,344	1,613	1,519	1,573
Digitisation	110	86	65	65	62	60	54
Renewable energy	561	543	519	503	586	687	859
Management	228	232	296	208	295	254	215
Engineering	14	23	21	26	24	17	26
Other	78	94	78	85	71	64	80
Landscaping	6	10	9	8	6	13	6
Equity	126	135	121	97	113	100	95
Architectural rehabilitation	57	47	25	48	47	23	24
Energy rehabilitation	11		-	8	4	-	21
Quality systems	-	-	-	-	1	15	14
Urban planning	45	66	52	60	72	65	40
Sustainable Architecture	98	138	124	153	144	115	128
Grand total	**1,959**	**2,331**	**2,637**	**2,658**	**3,069**	**2,966**	**3,171**

Table 24. Number of graduates in master's degrees directly related to energy efficiency and the use of renewable energy, in the field of Architecture and Engineering studies, by year. Source: Prepared by the authors based on data from the Ministry of Universities.

PhD (Doctorate) degrees

Students who complete their doctoral studies acquire skills and competencies related to research. Equivalent to EQF level 8. The Ministry of Universities does not provide data on the subjects of doctoral degrees at each university (as it does for Master's degrees), but it does identify the number of graduates of doctoral students in the field of architecture and engineering.

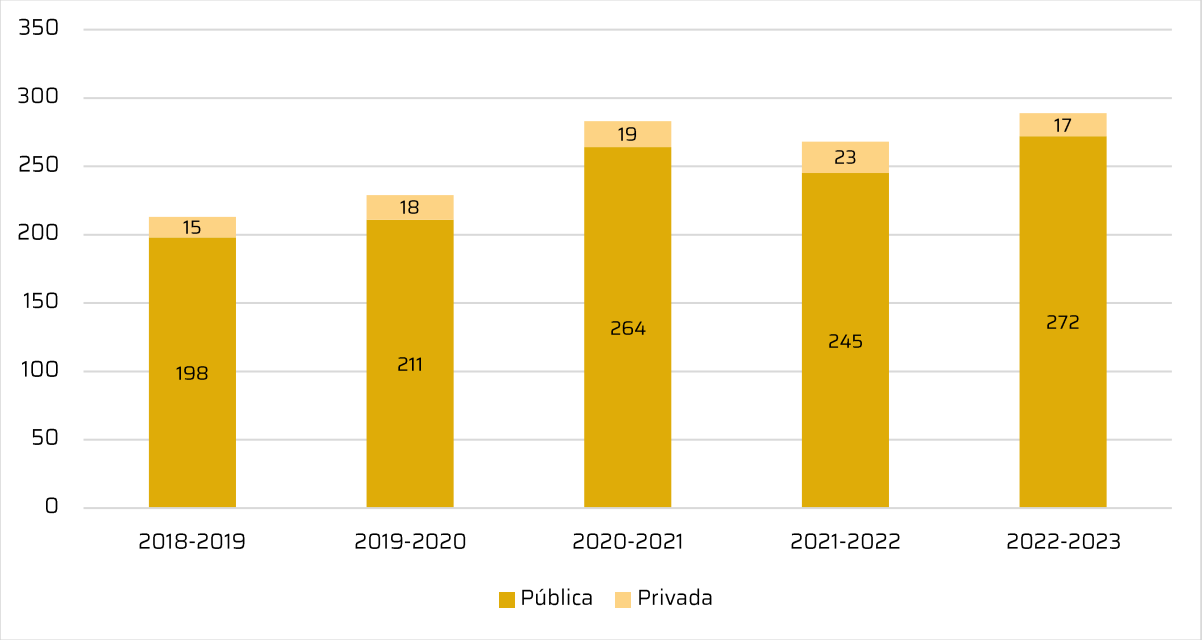


Chart 30. Number of graduates in doctorates in architecture and construction, by year and by type of institution. Source: Ministry of Universities.

5.4. Level of integration of skills to address the 2030 Climate Goals into the VET and university system

Within the framework of Construye 2030, experts have been used to analyse the level of integration of certain skills related to energy efficiency and the use of renewable energy in vocational training and university systems:

1. Implementing energy efficiency and renewable energy measures in buildings.
2. Implementing deep retrofitting of buildings, including through modular and industrialised solutions.
3. Building new nearly zero energy buildings (nZEB).
4. Integration of renewable energy.
5. Use of efficient heating and cooling technologies, including in particular the deployment of heat pumps; capacities for installers to conduct heating and cooling upgrades as part of retrofit projects.
6. Skills related to Lifetime Carbon (through the Global Warming Potential assessment), circular construction and resource efficiency, and leveraging the LEVEL(s) framework.

7. Digital skills to support improved energy performance of buildings, in particular through increased use of BIM.

8. Improving the intelligence of buildings in order to increase their energy performance (based on Smart Readiness Indicator), in particular in terms of sensors, building controls and building management system.

9. Skills for the energy improvement of historic (heritage) buildings.

The scores obtained on the level of integration of these skills in the education system are as follows:

	UNIVERSITY SYSTEM		VET SYSTEM	
	Average	Mode	Average	Mode
1. Implementing energy efficiency and renewable energy measures in buildings	4.00	4	3.25	3
2. Conducting a thorough renovation of buildings, including through modular and industrialised solutions	3.14	4	2.25	3
3. Building new near-zero energy buildings (nZEB)	3.63	4	2.38	2
4. Integration of renewable energy	3.57	4	3.33	3
5. Efficient heating and cooling technologies, including in particular the deployment of heat pumps; capacities for installers to conduct heating and cooling upgrades as part of retrofitting projects	3.50	4	3.43	3
6. Skills related to Lifetime Carbon (through the Global Warming Potential assessment), circular construction and resource efficiency, and leveraging the LEVEL(s) framework.	2.33	2	1.86	1
7. Digital skills to support improved energy performance of buildings, in particular through increased use of BIM	3.25	3	2.67	2
8. Improving the intelligence of buildings in order to increase their energy performance (based on Smart Readiness Indicator), in particular in terms of sensors, building controls and building management system	3.13	4	3.00	2
9. Skills for the energy improvement of historic (heritage) buildings	2.75	4	1.88	1

Table 25. Scores obtained in the fieldwork on the level of integration of certain skills in the VET and university systems. Scale from 1 to 5, where 1 is "Not at all" and 5 is "Completely".

It seems clear that the VET level of education tends to provide these skills to a lesser extent than the university, master's or doctoral level.

Only the skills on the Implementation of energy efficiency and renewable energy measures in buildings show an adequate score (from 4) at University/Master level.

The skills identified as the most deficient at both educational levels, but more intensively in VET, are those related to Lifetime Carbon skills (through the Global Warming Potential assessment), circular construction and resource efficiency, and taking advantage of the LEVEL(s) framework, and competencies for the energy improvement of historic (heritage) buildings.

In the specific case of VET, the skills to conduct a deepening of buildings, including through modular and industrialised solutions, the skills to Construct new nearly zero energy buildings (nZEB), and the Digital Skills to support improved energy performance of buildings, in particular through increased use of BIM, also emerge as deficient (with scores below 3 on the scale used).

5.5. Tools for market monitoring

In relation to the instruments that make it possible to follow up or monitor skills and training requirements, there are professional and occupational observatories:

PROFESSIONAL OBSERVATORY	INCUAL (MINISTRY OF EDUCATION AND VOCATIONAL EDUCATION AND TRAINING)
Its functions include: 1. Providing information on the evolution of the demand and supply of occupations in the labour market, considering occupational classification systems. 2. Promoting cooperation between sectoral and territorial observatories that may exist. 3. There is the RED ALERT as a communication channel, where occupations can be notified (along with the skills required) which are not included in the National Catalogue of Professional Qualifications.	
OBSERVATORY OF OCCUPATIONS	**SEPE (MINISTRY OF LABOUR)**
It provides information, based on qualitative and quantitative techniques on: 1. Prospecting and detection of the training needs of the productive system based on the identification of occupations that offer better job prospects in the short and medium term. 2. The occupational profiles of the job offer based on the economic activities and occupations with the best performance in employment and with the best prospects in the labour market. 3. The labour market situation of both graduates and occupations, as well as the annual state, provincial and municipal labour market reports. 4. Geographical mobility in the recruitment of workers. 5. The best performing occupations in terms of recruitment, as well as emerging or expanding sectors/activities. 6. Sectoral prospective studies. This Observatory has a network of techniques in every Provincial Directorate, which may be consulted here.	
OBSERVATORY OF THE CONSTRUCTION INDUSTRY	**FUNDACIÓN LABORAL DE LA CONSTRUCCIÓN (SOCIAL AGENTS)**
It provides quarterly and annual data at regional and national level, through bulletins and infographics on the evolution of the sector, innovation, training, health and safety and employment. It has a Barometer, which collects data on: building permits, mortgages, public tenders, social security affiliation, number of companies, employment and the labour market.	

OBSERVATORY OF VET	CAIXABANK
It is a portal focused on the analysis of the Vocational Education and Training system in Spain. It contains data and documents on the diagnosis of the situation and evolution of VET in Spain. It also provides a consolidated data on vocational education and training in the country.	
OBSERVATORIO 2030	**HIGHER COUNCIL OF THE SPANISH ARCHITECTS' ASSOCIATIONS**
With the aim of promoting the implementation of the Sustainable Development Goals in Spain, it compiles documentation and develops reports through its working groups, all in relation to the city understood as: territory in transition, productive, healthy, fair territory: access to dwelling and universal accessibility, quality territory, sustainable territory and digital territory.	
OBSERVATORY FOR NATURE-BASED SOLUTIONS.	**CONAMA FOUNDATION AND IUCN CENTRE FOR MEDITERRANEAN COOPERATION**
Collaborative space for professionals and entities who are interested and specialised in nature-based solutions. They disseminate a catalogued library of practical documents and a database of projects or a directory of occupations to enable the search for partnerships among users, as well as a series of relevant tools in the field.	
OBSERVATORY OF SKILLS FOR THE CONSTRUCTION SECTOR	**CONSTRUCTION BLUEPRINT**
This Skills Observatory has been created as a tool for observing and monitoring the skills needs expressed by construction companies in the different EU countries, allowing users to have a closer look at the anticipation of skills at national/European level. This Observatory is intended to complement the data and information provided on the construction ecosystem by the European Construction Sector Observatory (ECSO).	

Table 26. List of occupational and professional observatories. Source: prepared by the authors.

5.6. Training courses and initiatives not included in the continuing education system

There are many private courses and initiatives developed by private and even public companies or institutions, related to energy efficiency, renewable energy and sustainable construction in general; they are not courses with official certification and their quality and guarantee depends largely on the solvency of the entity or institution that implements them. Some of these courses are free but most are not, and some of the institutions are non-profit but most are private.

It is impossible to make a comprehensive list of institutions and companies that conduct training on this subject, but some recognised institutions in the sector that develop training related to sustainable construction are the Institute for Energy Diversification and Saving (IDAE), Escuela de Organización Industrial (EOI), Colegio Oficial de Arquitectos de Madrid (COAM), Consejo General de la Arquitectura Técnica de España (CGATE), Green Building Council España (GBCE). In addition, material manufacturers very often provide training for workers in the sector to learn about their materials and how to install them correctly.

6. Relevant projects on skills in the sector

6.1. Construction Blueprint Project. Strategic Skills Framework for the Construction Industry and its impact in Spain

One of the most relevant initiatives in terms of skills in the construction sector recently implemented is the **Construction Blueprint project**. **Strategic Skills Framework for the Construction Industry** has brought together 24 partners from 12 EU countries (12 VET providers, 9 national sectoral representatives, 3 European sectoral organisations), with the aim of developing a new strategic sectoral approach for cooperation on vocational skills in the construction industry, and to support a better match between the skills needs of companies and the skills provided to workers by training providers.

Global objective

Designing and implementing a sectoral strategy on occupational skills to reduce the skills gaps identified in relation to energy efficiency, the circular economy and the digitalisation of the sector with respect to the current training offered to construction workers and the demands and requirements of companies in the sector.

Activities

During the more than four years of the project, the partners have implemented a large number of activities, among the objectives of which was the identification of the most relevant skills needs for companies in Energy Efficiency, Circular Economy and Digitalisation. The project has focused particularly on levels 3-5 of the European Qualifications Framework.

In addition, activities have been conducted to improve the image of the sector and to attract young people and women.

Implementation in Spain

The activities proposed in the project have been implemented in all the countries of the consortium, and the results achieved are mainly applicable at European level, although they can be extrapolated to national level. The most relevant results, as well as their scope in Spain, are shown below:

6.1.1. Roadmap and Action Plan

Developed to establish a Sector Skills Strategy that has been deployed during the project implementation period and beyond. It comprises the main strategic measures, activities, milestones and results that should be implemented to adapt the demand for qualifications and the current training offer, in five strategic lines,

coinciding with the five helixes in which the project is inscribed: education, politics, social, environment and economy.

Scope: It is a consensus document at European level containing 45 potentially implementable measures in the five areas mentioned above. It is a "living" document that can be modified according to needs in the coming years.

6.1.2. PESTLE analysis

Analysis of the different external factors that may affect the construction sector and its evolution in terms of occupational skills and competencies: Political, Economic, Social, Technological, Legislative, Environmental. This analysis has enabled to systematically identify and reflect on the different study factors in order to have a clear vision of the context in which the Construction Blueprint project has been operating, and subsequently to be able to act strategically on them. Thus, the partners have sought to understand what will happen in the near future with regard to the shape of the construction sector, seizing the opportunities and anticipating the risks.

Scope: In order to conduct this analysis, 151 factsheets of identified trends, barriers, challenges and opportunities per factor have been designed at European level; a total of 81 expert interviews have also been conducted. Of these, 16 factsheets have been designed in Spain, and 7 interviews have been conducted.

6.1.3. Skills needs in the construction industry

It describes the current skills gaps of construction workers and the training needs in each participating country in energy efficiency, circular economy and digitalisation, which are necessary to implement the European Renovation Wave launched in 2020. The methodology included desk research, review by 25 NAG members (5 of whom were Spanish), and an international focus group for validation, composed of 8 participants and coordinated by the project team of the Fundación Laboral de la Construcción (ES).

Scope: The document has been one of the bases for the subsequent development of Vocational Education and Training (VET) curricula in these areas, as it shows a large number of related skills that have been analysed for the final selection of the modules to be included in the training programmes. It has also assisted in defining the surveys conducted on the skills needed in European construction companies.

6.1.4. Professions and qualifications to be modernised

Review of the most relevant European and national occupational profiles, as well as analysis of the skills that should be included in the process of improving sectoral skills in energy efficiency, circular economy and digitalisation. It involves a comprehensive analysis and comparison of different European information sources: ESCO (Classification of European Skills, Qualifications and Occupations), ECSO (European

Construction Sector Observatory), Cedefop (European Centre for the Development of VET), DigiComp Framework, European Qualifications Framework (EQF), BuildUp Skills initiatives, etc.

Scope: During the research, the most relevant occupational profiles in the sector were identified and, among them, those that need to be updated in terms of Energy Efficiency, Circular Economy and digitalisation have been prioritised: electrician, plumber, carpenter, bricklayer, air conditioning technician, foreman and supervisor. In addition, Deep Rehabilitation Specialist and GIS Specialist have been identified as emerging profiles. This document was another pillar for the subsequent development of European Vocational and Educational Training (VET) curricula, as it has helped to select the main profiles to be addressed by the training programmes.

6.1.5. National reports on the modernisation of occupational profiles

Each country in the consortium has developed a report including the most relevant profiles in the sector at national level that should be updated with skills related to energy efficiency, circular economy and/or digitalisation.

Scope: In Spain, 18 profiles have been identified, including: bricklayer, iron worker, formwork worker, roofer, window fitter, foreman, tiler, etc. In addition, a new emerging profile (Energy Auditor) is described. This analysis will support the players involved in the modernisation of vocational qualifications (public administration, social partners).

6.1.6. Observatory of skills in the construction sector

Online tool for identifying the skills needs; it will be mainly fed by the results of surveys conducted in European companies in the sector. The user can select country and area, and the information will be displayed interactively; information will also be available at European level. In addition, the tool includes other sections such as reports, articles and relevant (European/national) links related to skills and qualifications. The tool will be updated with the results of future surveys.

Scope: The results of the survey have made it possible to identify skills shortages in the construction sector, as well as an estimate of the number of workers affected (according to the companies' opinion). More than 1700 companies responded to the questionnaire (163 in Spain), the results of which gave the partners a first-hand view of the skills most needed by these companies in terms of energy efficiency, circular economy and digitisation. It is planned to repeat the survey in successive years in order to achieve comparable results.

6.1.7. Training programmes for VET

The analysis of the above results developed in the project has led to the design and development of 3 VET training plans, one for each project area.

Scope: The training programmes include a total of 45 training modules (15 modules for Energy Efficiency; 14 for Circular Economy; 16 for Digitalisation), amounting to more than 80 hours of training. For each of these modules, associated training materials have been developed, translated into national languages and used to run different pilot courses.

6.1.8. Development and impact in Spain

Almost 1000 people have participated in the consortium countries in pilot courses organised in the countries, which have been delivered through different methodologies (on-site, online, blended learning). In Spain, a total of 124 people participated: 67 in the energy efficiency pilot course, 30 in the circular economy course and 27 in the digitalisation course. The contents developed will be included in the Fundación Laboral's training offer.

6.1.9. Moodle platform

E-learning platform where courses and short modules (MOOCs) on energy efficiency, digitalisation and circular economy are available for anyone interested (registration required).

Scope: The platform consists of 75 short self-learning courses/modules: 22 courses for EE, 41 courses for Digitalisation and 12 for Circular Economy. Courses are available in different languages: English, Greek, Spanish, Lithuanian, French, Slovenian, Croatian, Croatian and German. In addition, the platform gives access to the online course developed for the H&S Blueprint Project, consisting of 8 modules related to Health and Safety and Waste Management in the sector (available in ES, EN, IT, SL, FR and DE).

6.1.10. Interactive map of good practices

The 12 project countries have identified different good practices and innovative initiatives (at regional and national level) that address skills gaps and mismatches in the fields of energy efficiency, digitalisation, circular economy or occupational health and safety.

Scope: These good practices have been described in the form of factsheets detailing information such as the entity, objectives, target groups and impact of the initiative. All this has been brought together in an indexed database with 130 concrete examples (15 from Spain) that can be consulted on an interactive, geo-referenced map. Users can apply filters to find the exact information they are looking for and download the results if they wish.

6.1.11. Other impacts

The results of the Construction Blueprint Project have played an important role in the development of the Skills Pact for the construction sector, launched by the three European sectoral organisations involved in

the sector, to which most of the project partners have adhered. This pact aims to train at least 25 % of the sector's workforce (3 million workers) and to attract young people and particularly women.

6.2. Funded projects related to skills upgrading in the construction sector

CONSTRUYE 2020+. A NEW MOMENTUM FOR GREEN JOBS, GROWTH AND SUSTAINABILITY	
Start date/End date	June 2018 - December 2021
Budget and programme	Horizon 2020 Programme EE14 Construction Skills of the European Union, from the "Secure, Clean and Efficient Energy" work package, CSA line Coordination and supporting action. **Budget:** € 797.111
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES). **Partners:** Eduardo Torroja Institute of Construction Sciences (CSIC), State Foundation for Employment Training (Fundae), Instituto Nacional de las Cualificaciones (Incual), under the Ministry of Education and Vocational Education and Training; Centre for Research on Energy Resources and Consumption (Circe) and Institute of Robotics and Information and Communication Technologies (IRTIC), attached to the University of Valencia. All partners are from Spain.
Brief description of the main results	• Roadmap for up-to-date training for a sustainable construction industry. • Two short awareness-raising courses for workers on energy efficiency in buildings. • Update of five training courses derived from the Roadmap developed in BuildUp Skills Spain. • Three types of "Green Label Accreditation" to recognise the ecological skills acquired in training courses for operators, middle management and specialised professionals. • Professional qualification "Energy Auditor". • Construye 2020+ route, which has reached 15 Spanish cities. Information in: https://construye2020plus.eu/en/home/

Table 27. Funded project related to skills upgrading in the construction sector Construye 2020+. A new momentum for green jobs, growth and sustainability Source: Prepared by the authors.

TRAINING AND OUTREACH PROGRAM FOR A CIRCULAR AND LEVEL(S) BASED REVOLUTION (TOP CLEVER)	
Start date/End date	2023-10-11/2023-09
Budget and programme	*LIFE*
Partners	GBCe- World GBC- Pl GBC-GBCcr- HuGBC- GBC Italia- GBC Slo

Brief description of the main results	The project aims to empower building professionals and workers with the necessary skills to address the challenges of the life cycle carbon and circular approach throughout the life cycle of a building, to also support the implementation of the Level(s) Framework by all players in the value chain. Innovative training programmes and activities for technicians and the construction workforce, including training of trainers, will be developed and tested, and specific actions will be undertaken to recognise and improve the preparation of young talents for future careers in the construction sector. The role of women will be at the centre of the debate, raising the voice of women professionals and workers to raise awareness of equal opportunities in the sector. A global platform will be designed to exploit the results of the project, bringing together knowledge and training materials from players in the green building movement across Europe and the world.

Table 28. Funded project related to skills upgrading in the construction sector Training and Outreach Program for a Circular and Level(s) based Revolution. Source: Prepared by the authors.

***GREEN GROWTH*: SKILLS TO MEET THE CHALLENGE OF THE CIRCULAR ECONOMY IN THE CONSTRUCTION SECTOR**	
Start date/End date	November 2020 - May 2023
Budget and programme	European Union Erasmus+ Programme, call 2020, under Key Action 2 Cooperation for innovation and exchange of good practices, within Strategic Partnerships for Vocational Education and Training. **Budget:** € 287,841.00
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES) **Partners:** Bildungszentren des Baugewerbes e.V. -BZB (DE); Sustainum Institut (DE); Centre IFAPME Liège-Huy-Verviers (BE); Centro Edile Andrea Palladio (IT); Chamber of Commerce and Industry of Slovenia -CCIS-. (SL); Armadillo Amarillo (ES)
Brief description of the main results	• Manual "Circular Economy in Practice" for teachers in the construction sector. • Online course on circular economy skills for the construction sector, aimed at teachers in the sector. • APP on circular economy in refurbishment works, aimed at construction workers and SMEs in the sector. • Roadmap for training centres to manage and include the circular economy as a transversal subject in their training plans. • Case studies and exercises: educational material for teachers on the application of circular economy in practice. Information in: https://greengrowthproject.eu/en/results/

Table 29. Funded project related to skills upgrading in the Green Growth construction sector: Skills to meet the challenge of the circular economy in the construction sector. Source: Prepared by the authors.

CDWASTE-MANAGEVET. DEVELOPMENT OF VET TO ADDRESS SKILLS NEEDS IN CONSTRUCTION AND DEMOLITION WASTE MANAGEMENT	
Start date/End date	November 2019 - July 2022
Budget and programme	Erasmus+ Programme of the European Union, call 2019, under the Key Action 2 Cooperation for Innovation and Exchange of Good Practices. **Budget:** € 332,212
Partners	**Coordinator:** Office de l'Environnement de la Corse -OEC- (FR). **Partners:** Fundación Laboral de la Construcción (ES); Ente Nazionale Per La Formazione E L'addestramento Professionale Nell Edilizia –Formedil- (IT) ; Pedmede Somateio (GR); European Knowledge Spot-EKS (GR); Instituto De Soldadura E Qualidade–ISQ- (PT); Universitatea Politehnica Din Bucuresti –UPB- (RO).
Brief description of the main results	• Good practice manual to identify future-proof skills for the management of construction and demolition waste. • VET training programme on Construction and Demolition Waste Management. • Online training platform, to implement the training contents developed. Information in: https://cdwaste-managevet.com/projects-outputs/

Table 30. Funded project related to skills upgrading in the construction sector. CDWaste-ManageVET. Development of VET to address skills needs in construction and demolition waste management Source: Prepared by the authors.

BUS.TRAINERS. BUILDING SKILLS IN ENERGY EFFICIENCY AND RENEWABLE ENERGY SYSTEMS FOR CONSTRUCTION INDUSTRY TRAINERS	
Start date/End date	December 2016 - November 2019
Budget and programme	Erasmus+ Programme of the European Union, call 2016, of the Key Action 2 Cooperation for Innovation and Exchange of Good Practices. **Budget:** € 968,645.00
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES). **Partners:** Confederación Nacional de la Construcción (ES); Institut de Robòtica i de Tecnologies de la Informació i de les Comunicacions -IRTIC- de la University of Valencia (ES); Associazione Nazionale de Costruttori Edili -Ance- (IT), Ente per la Formazione e l'addestramento professionale nell'edilizia -Formedil- (IT); Centro de Formação Profissional da Indústria da Construção Civil e Obras Públicas do Sul -Cenfic- (PT); National Laboratory of Energy and Geology -LNEG-. (PT); Centre for Renewable Energy Sources and Saving -Cres- (GR); The Small Enterprises' Institute of the Hellenic Confederation of Professionals, Craftsmen and Merchants -IME GSEVEE- (GR); Malta Intelligent Energy Management Agency -Miema- (MT); The Gozo Business Chamber -Gozo- (MT).
Brief description of the main results	• Report on the existing skills gap in trainers. • Map of skills needed in EE and EERR.

	• European sectoral qualification "Eco-trainer in the construction industry". • European certification in environmental skills. • E-learning platform for trainers Information in: http://ecotrainers.eu/wordpress/en/outcomes-en/

Table 31. Funded project related to skills upgrading in the construction sector. Bus.Trainers. Building skills in energy efficiency and renewable energy systems for trainers in the construction industry. Source: Prepared by the authors.

NATURBUILD. *NATURE BASED SOLUTIONS*: GREEN ROOF TRAINING FOR URBAN AND BUILDING SUSTAINABILITY	
Start date/End date	January 2022 - June 2024
Budget and programme	Erasmus+ Programme of the European Union, call 2021, under Key Action 2 Cooperation Partnerships in Vocational Education and Training. **Budget:** € 328,900.00
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES). **Partners:** Pedmede Somateioe (GR); Scuola Edile Piacenza (IT); Laboratorio Nacional de Energia e Geologia (PT); Instituto de Robótica y Tecnologías de la Información y la Comunicación (IRTIC), attached to Universidad de Valencia (ES).
Brief description of the main results	The course is currently under implementation, the main outcomes will be: • Training action on benefits, installation, maintenance and deconstruction of green roofs. • Interactive map with detailed information on some examples of green roofs in the countries participating in the project. • Reports and documents to support the delivery of the green roof course: • Analysis on the regulation on green roofs and good practices in the countries of the project. • Course learning outcomes. Information in https://naturbuild.eu/en/results/

Tabla 32. Funded project related to skills upgrading in the construction sector. NaturBuild. Nature Based Solutions: green roof training for urban and building sustainability. Source: Prepared by the authors.

***BUILDOFFSITEEU*. INDUSTRIALISED CONSTRUCTION: TOWARDS INNOVATION IN THE CONSTRUCTION SECTOR**	
Start date/End date	December 2022 - December 2024
Budget and programme	Erasmus+ Programme of the European Union, call 2022, under Key Action 2 Cooperation Partnerships in Vocational Education and Training. **Budget:** € 250,000

Partners	**Coordinator:** Fundación Laboral de la Construcción (ES) **Partners:** Knowledge and skills management centre -K&S- (MK); Gospodarska Zbornica Slovenije (SL); Istituto per l'istrucione professionale dei lavoratori edili della provincia di Bologna -IIPLE- (IT); Pedmede Somateio (GR).
Brief description of the main results	The project is currently under implementation, the main outputs will be: • Digital factsheets on industrialised building systems. • Interactive map of new skills for industrialised construction. • Training itinerary with proposals for new skills in industrialised construction. Information in https://buildoffsite.fundacionlaboral.org/results/

Table 33. Funded project related to skills upgrading in the construction sector. BuildOffsiteEU. Industrialised construction: towards innovation in the construction sector. Source: Prepared by the authors.

***TRAIN4SUSTAIN*. ESTABLISHMENT OF QUALITY STANDARDS FOR FUTURE-ORIENTED TRAINING AND QUALIFICATION TO PROMOTE THE UPTAKE OF SUSTAINABLE ENERGY SKILLS IN THE BUILDING SECTOR**	
Start date/End date	May 2020 - October 2022
Budget and programme	Horizon 2020 Programme. Sub-programme: SC3-Safe, Clean and Efficient Energy **Budget:** €994,375
Partners	**Coordinator:** Geonardo Environmental Technologies LTD. (HU) **Partners:** Jakob Energy Research Gmbh & Co. KG (DE); International Initiative for Sustainable Built Environment Italia Research and Development Srl (IT). Istituto per l'struzione Professionale dei Lavoratori Edili della Provincia di Bologna (IT); Departamento de la Vicepresidencia i de Políticas Digitales i Territorio - Generalitat de Catalunya (ES); Ordine Degli Architetti Di Bologna (IT); Construction Quality Agency (AQC) (FR)
Brief description of the main results	• European Register of Skills. Web-based platform providing functions to compare different qualification schemes and learning outcomes. • Skills Passport. Tool to promote the comparison of skills levels between professions in Europe. • Electronic inventory. Database storing information on courses and training material. • Centre for networking between centres and experts. Information in https://train4sustain.eu/services

Table 34. Funded project related to skills upgrading in the construction sector. Train4Sustain. Establishment of quality standards for future-oriented training and qualification to promote the uptake of sustainable energy skills in the building sector. Source: Prepared by the authors.

***SEETHESKILLS*. SUSTAINABLE ENERGY SKILLS IN CONSTRUCTION: VISIBLE, VALIDATED, VALUABLE**	
Start date/End date	June 2021 - May 2024
Budget and programme	Horizonte 2020. Societal challenges - safe, clean and efficient energy **Budget:** € 998,612.50
Partners	**Coordinator:** Economic Chamber of Macedonia (MK) **Partners:** Ss Cyril and Methodius University (MK); University of Ljubljana (SL); BIM Academy (ES); Slovak Chamber of Civil Engineering (SK); ABC Creation (MK); Slovak University of Technology (SK); ITEC (ES); Slovenian Chamber of Commerce and Industry (SL); ISSO (NL)
Brief description of the main results	Some of the main results are the so-called e-tools (online tools), such as: • E-learning platform. • Process of recognition of prior learning. • Microlearning and gamification. • Digital badge. • APP for self-assessment of skills. • Online post-occupancy dwelling assessment tool. • BIM tools • Database of professionals. Information in: https://seetheskills.eu/e-tools/

Table 35. Funded project related to skills upgrading in the construction sector. SEEtheSkills. Sustainable energy skills in construction: Visible, Validated, Valuable. Source: Prepared by the authors.

***ADD-ON-SKILLS*. ADVANCED DIGITAL COURSE ON MODERN BUILDINGS DEVELOPING SKILLS FOR YOUNG ENGINEERS**	
Start date/End date	2021 - 2023
Budget and programme	Erasmus+ Programme **Budget:** € 261,018
Partners	**Coordinator:** Universidad Tecnológica de Bialystok (PL) **Partners:** Vilnius College of Technologies and Design (LT); Rezekne Academy of Technologies (LV); University of Cordoba (ES); University of Florence (IT); Polish Association of Construction Engineers and Technicians (PL).
Brief description of the main results	• Educational materials related to sustainable construction, in the languages of the consortium. • Books I and II on Sustainable Buildings. • Training programme in sustainable construction. Information in: https://addonskills.pb.edu.pl/#intellectual-outputs

Table 36. Funded project related to skills upgrading in the construction sector. Add-on-Skills. Advanced digital course on modern buildings developing skills for young engineers. Source: Prepared by the authors.

ENERGY EFFICIENCY EXPERT	
Start date/End date	November 2020 - November 2022
Budget and programme	Erasmus+ Programme. Cooperation for innovation and exchange of best practices **Budget:** € 257,164
Partners	**Coordinator:** Politecnico De Torino (IT) **Partners:** A & A Emphasys Interactive Solutions Ltd (CY); Cooperation Bancaire Pour L'europe (BE); Instituto Jozef Stefan (SL); P-Learning Srl (IT); Politeknika Ikastegia Txorierri S.Coop (ES)
Brief description of the main results	• CV of the figure of the energy efficiency expert. • Associated training content. • Online training platform. • Training of trainers course Information in: https://eeexpert-project.eu/intellectual-output-1/#

Table 37. Funded project related to skills upgrading in the construction sector. Energy Efficiency Expert. Source: Prepared by the authors.

EMICGEM: EMBRACING MODULAR INNOVATION IN CONSTRUCTION – GETTING EDUCATION MODERNISED	
Start date/End date	September 2019 - December 2022
Budget and programme	Erasmus+ Programme. Cooperation for innovation and exchange of good practices. Strategic alliances for higher education **Budget:** € 209,677.36
Partners	**Coordinator:** City of Glasgow College (GB) **Partners:** ACADEMIA, izobrazevanje in druge storitve doo (SL); Berufsschule Pinkafeld (AT); Centro Integrado de Formación profesional construcción Bizkaia (ES); Edinburgh Napier University (GB); Europaisches Institut Fur Innovation-Technologie Ev (DE); Gemeinnuetziges Berufsfoerderungswerk GmbH (DE); Gospodarska Zbornica Slovenije Center Za Poslovno Usposabljanje (SL).
Brief description of the main results	• Skills framework for prefabricated and modular construction. • Training modules on prefabricated and modular construction. • Online training course on prefabricated and modular construction. • Case studies. Information in: https://emic-gem.eu

Table 38. Funded project related to skills upgrading in the construction sector. EMICGEM: Embracing Modular Innovation in Construction - Getting Education Modernised. Source: Prepared by the authors.

6.3. Projects aiming to make the sector more attractive to women

***WOMEN CAN BUILD*. RETHINKING VET TOWARDS AN EGALITARIAN CONSTRUCTION INDUSTRY**	
Start date/End date	September 2017 - October 2020
Budget and programme	Erasmus+ Programme of the European Union, call 2017, Key Action 2 Cooperation for Innovation and Exchange of Good Practices. **Budget:** € 293,121
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES) **Partners:** Agencia para el Empleo del Ayuntamiento de Madrid (ES), Bildungszentren des Baugewerbes eV -BZB- (DE), Centro de Formação Profissional da Indústria da Construção Civil e Obras Públicas do Sul -Cenfic- (PTI), Centre IFAPME Liège-Huy-Verviers (BE), Comité de Concertation et de Coordination de l'Apprentissage du Bâtiment et des Travaux Publics -CCCA-BTP- (FR), Ente per la Formazione e l'addestramento professionale nell'edilizia -Formedil- (IT) y Fondazione ECIPA-Ente Confederale di Istruzione Professionale per l'Artigianato e le Piccole Imprese-CNA (IT).
Brief description of the main results	Depending on the target group, the following results have been developed: **For teaching staff:** • Report on gender equality in teaching practice. • Online course on developing gender equality skills for construction teachers. **For women:** • Testimonials, 'first person' experiences of inspirational figures. • Immersive courses for women + integrated reports. • Videos of FLC students. **For training centres in the sector:** • Recommendations for gender mainstreaming in construction vocational education and training centres. **For companies in the sector:** • Roadmap and Business Action Plan towards an Equality Sector. Information in: https://www.womencanbuild.eu/en/outcomes/

Table 39. Funded project related to skills upgrading in the construction sector. EMICGEM: Embracing Modular Innovation in Construction - Getting Education Modernised. Source: Prepared by the authors.

***FEMCON*: EMPOWERING THE FEMALE WORKFORCE IN CONSTRUCTION**	
Start date/End date	May 2022 - October 2024
Budget and programme	European Union Erasmus+ Programme, call 2021, under Key Action 2 Cooperation Partnerships for Vocational Education and Training (VET). **Budget:** € 285,000
Partners	**Coordinator:** Polish Federation of Engineering Associations, "NOT" (Poland).

	Partners: Fundación Laboral de la Construcción (ES), Momentum (IE), Future Cast (IE), Outside Media & Knowledge (DE) y European E-Learning Institute - EUEI- (DK).
Brief description of the main results	• Inclusion Reach & Teach toolkit for teachers • Curriculum. Open education resources for teachers • Good practices of women in construction, to inspire women • Interactive digital learning platform Information in: https://femalesinconstruction.eu/resources/

Table 40. Funded project related to skills upgrading in the construction sector. FemCon: Empowering female workforce in construction. Source: Prepared by the authors.

***PACT4YOUTH*. SUPPORT FOR THE PACT FOR SKILLS. FOUNDATIONS FOR THE EMPLOYABILITY OF YOUNG PEOPLE IN THE CONSTRUCTION SECTOR**	
Start date/End date	January 2023 - December 2024
Budget and programme	European Union Erasmus+, Key Action 2 (Forward-looking projects). Lot2 (FP). Priority 3 (Support to the Skills Pact). **Budget:** € 691,198
Partners	**Coordinator:** Fundación Laboral de la Construcción (ES). **Partners:** Confederación Nacional de la Construcción (ES), U Studies (GR), Pedmede Somateio (GR), Formedil (T), Associazione Nazionale Costruttori Edili (IT), Kentro Ekpaideysis "O Oikodomos" K.E.P.O. LTD (CY), Omospondia SyndesmonErgolavon Oikodomon Kyprou -OSEOK- (CY).
Brief description of the main results	In this project, women are a priority group. The results are: • Roadmap and Action Plan for the employability of young people and women. • Intermediation services and accompanying measures. • Signing of collaboration agreements between SMEs and training centres to implement work-based training programmes. • Practical training days to increase the interest of young people and women in the construction sector. • Increased SME participation in learning processes. • Awareness-raising, communication and dissemination campaigns aimed at SMEs and young people. • Accession to the Skills Pact. Información en: https://pact4youth.fundacionlaboral.org/results/

Table 41. Funded project related to skills upgrading in the construction sector. Pact4Youth. Support for the Pact for Skills. Foundations for the employability of young people in the construction sector. Source: Prepared by the authors.

WOMEN BUILD	
Funding agency	VÍA ÁGORA Corporation, channelled through the Gómez - Pintado Foundation.
Purpose	Enabling the incorporation of women into the construction process within the real estate sector, in line with the fulfilment of the Sustainable Development Goals, specifically SDG 5 (gender equality). To this end, they develop a continuous training plan, so that all those interested parties who do not have specific training in these matters can reach the level of skills necessary to conduct any trade in construction.

Table 42. Funded project related to skills upgrading in the construction sector. Women Build. Source: Prepared by the authors.

6.4. Projects aiming at upgrading the skills of workers from highly polluting industries

CEMENT SKILLS 2030	
Start date/End date	2023/07/01- 2025/06/30
Budget and programme	Social Prerogatives and Specific skills Lines SOCPL-2022-SOC-DIALOG. **Budget:** €323,359
Partners	**Partners:** European Federation of Building and Woodworkers (EFBWW) and European Cement Association (CEMBUREAU)
Brief description of the main results	Future challenges and development joint approaches and strategic for the green transition of the cement sector, with an impact in employment skills and qualifications of workers in the cement sector.

Table 43. Project with the aim of updating skills. CEMENT SKILLS 2030. Source: Prepared by the authors.

MAVETJ PROJECT EMPLOYMENT VULNERABILITY MAPPING FOR A FAIR TRANSITION: ANALYSIS OF PRODUCTIVE SECTORS AND DEVELOPMENT OF SKILLS AND OPPORTUNITIES TO ADAPT TO CLIMATE CHANGE	
Start date/End date	2020-2021
Partners	**Coordinator:** Project developed by the UGT Secretariat of Occupational Health and Environment **Entidades que apoyan el proyecto:** Ministry for Ecological Transition and Demographic Challenge; BioDiversidad Foundation; Spanish Climate Change Office; and Plan to Boost the Environment for Adaptation to Climate Change.
Brief description of the main results	The main objective of the project is to favour a fair transition in the productive sectors mainly involved in adapting to climate change, avoiding the negative consequences

	on employment and analysing the opportunities and job opportunities derived from the ecological transition. The main results are: • Final report of the conclusions of the high-level panel on just transition and employment opportunities arising from adaptation. • Quantitative/qualitative study on the employment vulnerability of the ecological transition and analysis of employment niches arising from climate change adaptation. • Interactive map of vulnerability and opportunities for climate change adaptation. • Final report on the conclusions of the international seminar "Just Transition and Employment Impacts and Opportunities arising from Adaptation to Climate Change". Information in:https://www.ugt.es/ugt-presenta-los-productos-finales-del-proyecto-mavetj

Table 44. Project with the aim of updating skills. MAVETJ Project Employment vulnerability mapping for a Just Transition: analysis of productive sectors and development of capacities and opportunities for climate change adaptation. Source: Prepared by the authors.

7. Skills gaps in the construction sector to achieve the 2030 Goals

7.1. Workforce developments

The growth of the employed population from 2011 to 2022 has been remarkable and generalised to all productive sectors.

AREA OF ACTIVITY	NUMBER OF MEMBERS		CHANGE IN THE PERIOD 2011-2022	
	DEC-11	DEC-23	ABSOLUTE	PERCENTGE
Agriculture	1,224,466	1,036,127	-188,339	-15.4%
Industry	2,160,772	2,379,853	219,081	10.1%
Construction	**1,241,619**	**1,401,956**	**160,337**	**12.9%**
Services	12,344,873	15,978,130	3,633,257	29.4%
Other	173,424			
Total	**17,112,796**	**20,774,625**	**3,661,829**	**21.4%**

Table 45. Evolution of employment dynamics by sector of activity, through the number of social security affiliates. Source: Ministry of Employment and Social Security SS membership statistics 2011 and 2022.

According to the Social Security membership data, referring to December 2011 and 2023, the evolution of the workforce in the construction sector as a whole can be observed.

Based on membership data from December 2011, a year in which the sector was still trying to overcome a period in which activity in the sector declined sharply after the onset of the financial crisis in 2007-2008, there is an increase of 21.4 % in membership up to December 2023.

In order to know the employment forecast for the following years, various secondary sources have been consulted in which employment surveys related to the construction sector have been conducted:

On the one hand, as shown in Illustration 05, the Long-term Energy Rehabilitation Strategy in the Rehabilitation Sector (ERESEE, 2020) estimate that the energy rehabilitation of buildings and the energy efficiency of the dwelling stock to take place in Spain as part of the Renovation Wave will generate between 33,000 and 88,000 new jobs between 2021 and 2030. This job creation is mainly due to the investments planned for the replacement of thermal installations (Subst. Inst.), especially in the first half of the decade; and in thermal envelope rehabilitation (Thermal Env.) as the period progresses.

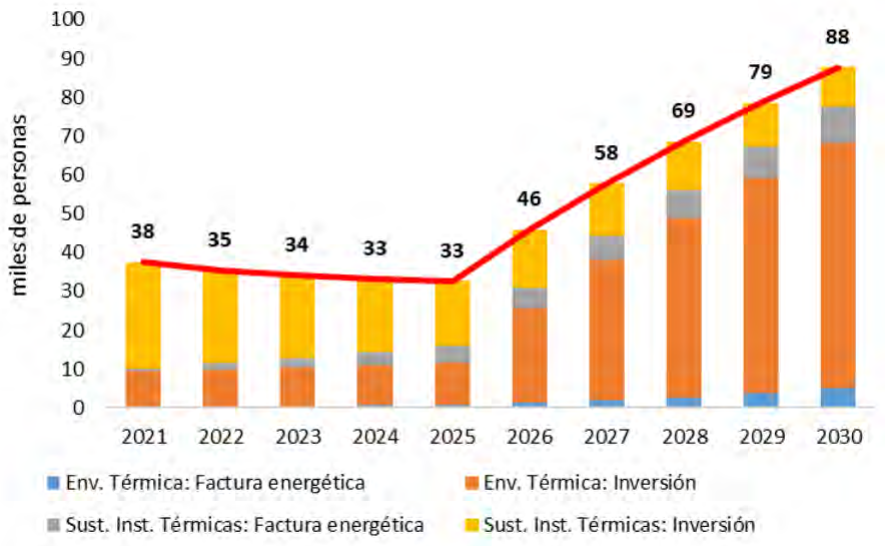


Chart 31. Change in employment (thousands of people) in the period 2021-2030, based on the investments foreseen by ERESEE. Source: ERESEE

On the other hand, the National Integrated Energy and Climate Plan 2021-2030 (currently under review) states that the investments forecast in this Plan would have an impact on employment growth of between 33,000 and 48,000 people/year. Thus, between 2021 and 2030, construction is expected to generate an average of 41,700 jobs per year.

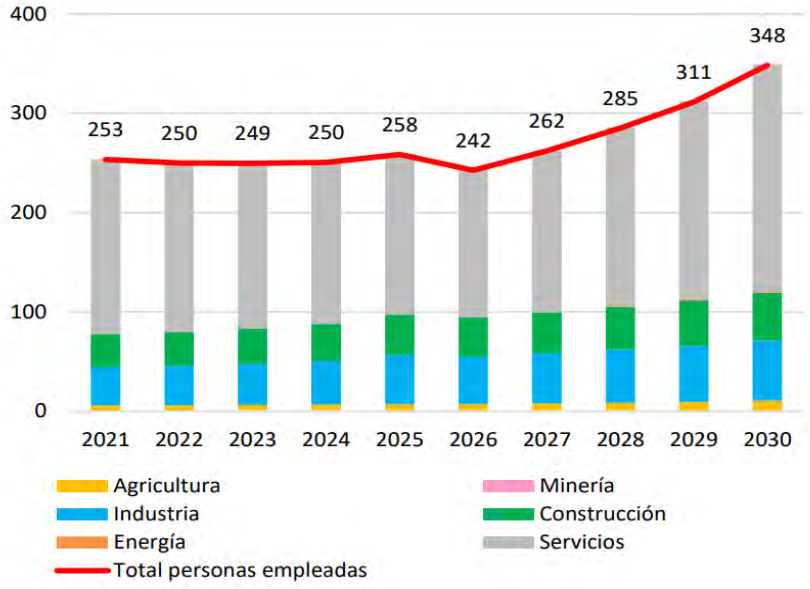


Chart 32. Number of net jobs generated by major sectors (thousands of people per year). Source: chart made by the Basque Centre for Climate Change (2019), included in PNIEC 2021-2030.

Finally, CEDEFOP Skills Forecast estimates that the workforce in the sector in Spain will increase by only 7,623[5] workers by 2030. This only represents an 0.6% increase of the workforce in the sector.

All these scenarios foresee employment growth linked to investment in certain actions in the construction sector. A direct consequence of this employment generation is the need to train and update the skills of workers in new construction systems, new technologies, the introduction of energy efficiency in design or the adaptation of buildings to new climatic conditions.

Training actions addressing these needs should consider the following characteristics of the construction sector:

- **Need for generational renewal:** Currently, 35% of the people employed in the sector are over 50 years old, which means that there is an important need to incorporate workers into the sector, especially in occupations on the construction site, which are the most represented. The latter fact also affects the decline of occupational profiles in traditional trades. Age and occupational profile are relevant data for the design and focus of the training.

- **Need to incorporate qualified professionals:** There is a need for skilled workforce in the sector, which also affects integrated building rehabilitation activities and makes it difficult to achieve the objectives of the European Green Pact. The number of graduates from the education system is lower than desired. Training needs to be made more attractive, especially for young people, women and workers in other sectors.

Therefore, now more than ever, the search for strategies to overcome workforce shortages is one of the priorities for the sector. The experts who participated in the qualitative study Construye 2030 propose the following:

- **Modernising the image of the sector.** The construction sector has an unattractive image. However, its different players are working to increasingly improve the working conditions in the sector, as stated in the General Agreement of the Construction Sector, and are promoting a sector based on constant innovation, sustainability, modernity and social contribution. The way forward will therefore be to redirect its image in order to re-qualify workers and attract a new workforce, especially among the youngest and among women, by highlighting all its benefits.

- **Promoting specialised training.** The education system and the labour system must work together to adapt to the current needs of the market, with an emphasis on creating more specialised training opportunities in the different aspects of construction: architecture and engineering,

[5] Caixabank Dualiza (2023, 18 December). *Observatory of Vocational Education and Training* https://www.observatoriofp.com

manufacturing, digitalisation, quality control, construction materials, budget review, building, transport, installation... Training is the necessary tool to re-qualify workers in the sector and to attract new qualified talent, and will help to enhance the value of a profession that is actually creative, practical, technical, sustainable, with a great projection and with great opportunities for professional development.

- **Expanding construction techniques.** For example, those involving processes with a high level of technological and automated components. Offering a variety of ways to build can attract new workforce for several reasons: it minimises occupational risks, boosts specialised training and attracts the attention of a younger workforce and women.

- **Enhancing its innovative and technological value.** Digitalisation in the construction sector can attract new profiles: application of digital control systems, BIM, virtual and augmented reality, Big Data, Internet of Things, Cloud Computing, revolutionary products and materials.

- **Use of automation in processes with a high risk for the safety and health of workers.** This can be achieved by using robots and drones to perform dangerous tasks, such as drilling holes or placing beams.

Employees' relationship with training

In the face of the need to upgrade skills and attract skilled workers to the sector, some experts believe that there seems to be a need for greater recognition of training. Possible solutions include the following:

- **In terms of continuing education provision**, it is important to offer guidance on training pathways, especially to those without a tradition of formal studies, supported by public calls for state or regional training plans that allow for the continuous financing of these pathways over time. This guarantee of being able to follow a medium-term pathway offers security for students, who can develop a career plan, and for training centres, which can plan better and offer better services to their users.

- **Encourage the accreditation of skills through experience.** In this way, it contributes to increasing the possibilities of labour market insertion and improving the occupational profile by obtaining official certifications, as well as favouring continuing education.

- According to the experts, although training is currently adapted to the requirements of the Technical Code of Buildings, **there should be a training in place that enables a more immediate incorporation into the labour market**. The skills that should be included to a greater extent in the education system are working in multidisciplinary teams (incorporating collaboration between the VET and university system) or problem solving (promoting the project-based training methodology), skills that are very relevant for the sector.

- The experts believe that current training on EE and RES-E exists and that, in general, **it is varied**, albeit scattered. For example, in relation to higher studies, the different universities provide their own training; on in the case of training form employed people, some courses of the reference Plans that are channelled through the SEPE (see chapter 5.3) are **excessively generic.**

- In general, there is a perception that more workers need to be trained on a more continuous basis, which would enable the updating of skills and re-qualification in the field of energy efficiency and renewable energy.

- Finally, it is important to highlight that **for the SMEs** in the sector (which constitute more than 98% of the business fabric), the **organisation** and **imparting of training courses is hampered** by interference with their production deadlines.

Attractiveness of the sector for young people and women

Some of the experts consulted refer to the lack of attractiveness of the sector; the task of giving visibility to the sector is considered to be very complex. In order to increase the participation of construction workers in continuous training actions, it would be very important to highlight the different occupations and jobs in the sector to society in general.

- Digitalisation, the use of new technologies, industrialisation, etc., offer new ways of interacting with production processes, which will require skilled workers, which is an opportunity to attract talent to the sector and those workers who want to retrain in this field.

- There is an increasing incorporation of women in the sector, most notably in positions occupied by white collars. According to the 2022 Annual Report on the Construction Sector, published by the Construction Industry Observatory, in 2022, women under the Social Security regime in the construction sector numbered 147,337, increasing by 7,711 more workers than the previous year.

7.2. Skills needs

Although, compared to the previous Status Quo, there are more courses specifically related to energy efficiency in buildings and renewable energy, there is still a need for workers along the whole value chain in the sector to update their skills in energy efficiency and renewable energy in buildings.

In Spain there is a polarisation between high and low-skilled profiles in all productive sectors, including construction. In particular, 52.1% of employees in the sector have very low levels of training (EQF levels 1 and 2), compared to 25.1% with higher levels (EQF levels 5-8). These figures are significantly different from the European average, which has an employee population with low levels of education of 25.9% and 17.4% of workers with a high level of education (Construction Industry Observatory, 2023).

Continuous training to acquire new knowledge is necessary if we want to have highly qualified workers adapted to the new needs in terms of sustainability, digitalisation and industrialisation.

To detect and identify the skills required for each profession and skills level, an essential step is to observe and analyse various sources of information:

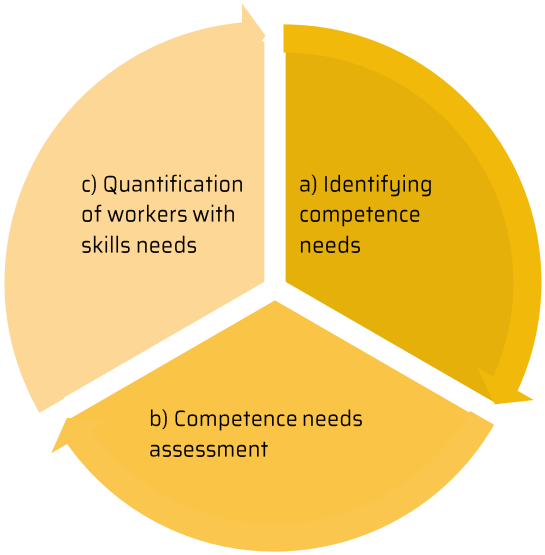


Figure 8. Methodology of analysis for the detection and identification of skills needs. Source: Prepared by the authors.

7.2.1. Identification of skill needs

Continuing with the methodology used in the Status Quo published in 2012, 3 variables are considered to detect skill needs, on which follow-up work must be established.

Regulations

From the **regulatory implementation** comes the need to conduct **new tasks and procedures** for which it is necessary to establish **new training pathways**.

In this regard, experts agree that a large number of buildings in the building stock are highly inefficient (in terms of EE and RES-E), as constructions prior to the implementation of the Technical Building Code have very different characteristics to buildings constructed afterwards. It is in these areas where a comprehensive rehabilitation of existing buildings, which are the most inefficient from an energy efficiency point of view, is necessary.

It seems clear that as the regulations for building construction entails more demanding environmental goals or energy savings, this will represent an opportunity to improve the training and qualification levels of workers with regard to these goals.

Nowadays, it seems that **current regulation** has a **short-term view** on EE and RES-E: it prioritises the CO_2 footprint without considering other elements, such as methodologies based on LCA (Life Cycle Assessment). In this way, the experts propose improvements to the regulations, such as adapting the current Technical Code, in order to make it much more demanding by ensuring that **buildings are increasingly passive** (that do not need any energy for heating or cooling), to conduct a Life Cycle Analysis of the building and to contemplate different **bioclimatic strategies incorporated** such as the existence of patios or awnings, aimed at improving energy efficiency.

CNAE / CNO / NACE and ISCO

The study of the **economic activities** (CNAE), through the movements in the activity headings, are indicative of the growth of economic activities. In this study, heading F (Construction) is addressed.

The analysis of **occupations** (CNO) focuses on the volume of workers in each activity heading, thus detecting where there is a greater volume of workers and an increase in the number of employed persons.

Establishing the threshold from which it is necessary to design new skills is a complicated task, for which complementary observation of classifications at European level (**NACE and ISCO**) is necessary, in order to detect the trend and possible forecast of activities and occupations.

Innovative companies

Similarly, the observation of innovative companies seems relevant, as they are major drivers of change, and generally the ones who invest the most in R&D&I.

The new technologies implemented, which workers are involved in this activity and the roles performed must be analysed.

The training actions implemented to train their own workers in these innovations should be extended to the rest of the sector.

Companies have an important role to play in terms of training, as companies that develop new materials and innovative building solutions can determine the skills required by the people who will install them.

Also, some SMEs, especially in the *start-up* construction and related sectors, are another important source of innovation and technological development.

7.2.2. Diagnosis of skill needs

Having identified the regulations, the statistical sources of reference in terms of company activities and occupational profiles, in addition to where innovation is to be found, the next step in the study of skills gaps was the diagnosis of skills needs.

This diagnosis has been conducted through an important qualitative fieldwork in which more than 30 experts from different areas of the sector, mentioned in the second section of this report, have participated.

The key was to have different representative voices from the sector, with different profiles and areas of work: educational, political, administrative, social and environmental.

These experts have been involved in the fieldwork through the following techniques:

- In-depth interviews, conducted with the segment of industry representatives, business associations, companies and self-employed.

- Expert group focusing on the skills needs of construction workers with EQF levels 5-8 (referred to in this study as "technical workers", "office workers" or "workers with higher education"). By

- Group of expert, focusing on the skills needs of construction workers with EQF levels 3-4 (referred to in the study as the "Site workers" segment).

The steps for the identification of skills needs were as follows:

- Assessment of the **relevance of the construction phase** with regard to its influence on the correct efficient performance of the building.

- Identification of relevant **occupational profiles** within the work.

- Identification of **skills** of each occupational profile and assessment of the most relevant ones. For profiles at levels 3-5, the structure of activities and skills identified in the **Skills Observatory for the Construction sector** of the Construction Blueprint project has been followed, in order to be able to make comparisons between results.

In addition, recently published studies related to employment and green transition have been reviewed. These studies have served either to support the fieldwork or to complement the results, since the methodology of these studies is similar to that of Construye 2030, for example:

- "Report on Skills Needs Analysis in the Construction Industry". Construction Blueprint Project, 2022.

- "Employment and ecological transition. Sources of employment, labour transformation and training challenges in sectors related to climate change and biodiversity in Spain". May 2023 Study coordinated by the Biodiversity Foundation and the Spanish Climate Change Office. Ministry for Ecological Transition and the Demographic Challenge. In this study, an employment

study was conducted, structured along two axes, the so-called "bio-related axis" and the "climate-related axis".

- "Report on Prospection and Detection of Training Needs". June 2022 Observatory of the State Public Employment Service. Ministry of Labour and Social Economy.

- "Study on the training needs of the construction sector". May 2021 Fundación Laboral de la Construcción and University of Zaragoza.

The results obtained in each of these stages, after analysis of the results of the techniques mentioned above, are shown below.

Phases of activities in the building process relevant to energy efficiency and renewable energy

In order to obtain an assessment of the entire value chain, all phases of the construction process were assessed in relation to energy efficiency and the use of renewable energy:

PHASES OF WORK IDENTIFIED			
1	Urban planning and building projects	7	Cooling, heating and hot water installations
2	Control and monitoring of the execution of works	8	Electrical and lighting installations in buildings and urban areas
3	Thermal insulation, acoustic insulation and waterproofing of buildings	9	Parks, gardens, waterworks and urban drains
4	Exterior carpentry and solar protection	10	Maintenance of buildings and urban facilities
5	Sealing of joints and seals	11	Selective demolitions
6	Renewable energy production facilities	12	Waste management on construction sites

Table 46. Phases of activities in the construction process relevant to energy efficiency and renewable energy. Source: Prepared by the authors.

The work phases were analysed through the three techniques mentioned above (interviews, expert groups, Delphi panel). Below is a chart visualising the main differences between the three segments:

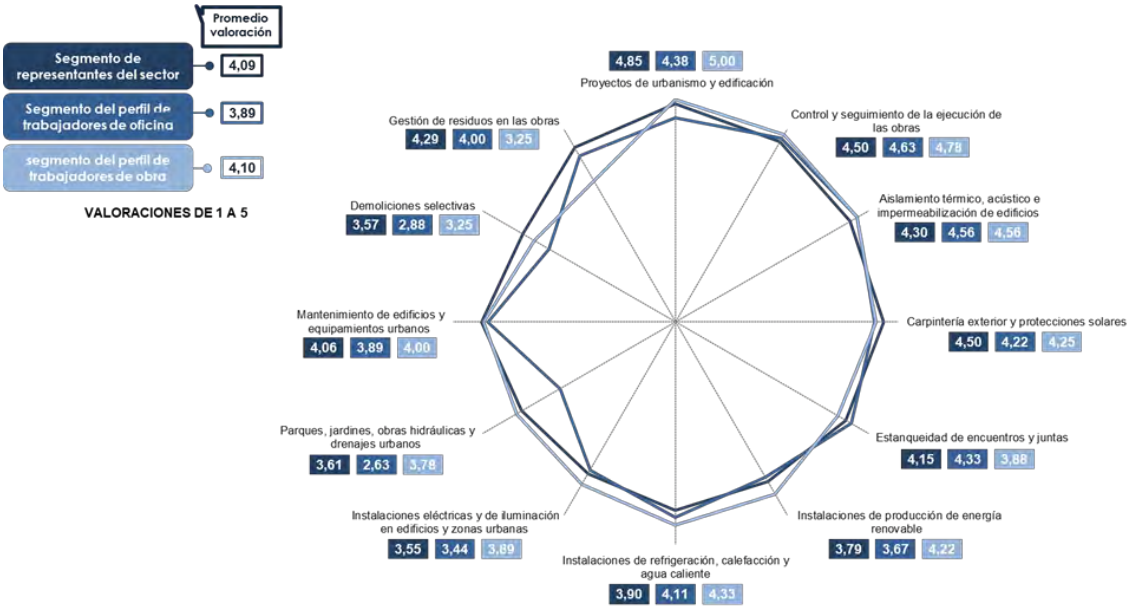


Figure 9. Comparative analysis of the FIELD WORK in relation to the level of importance of each phase of the construction process, within the objectives of EE and EERR, depending on the different segments analysed.

The main differences between phases are found in: parks, gardens, waterworks and urban drainage (where the office workers segment gives less importance), in waste management on construction sites (where less importance is observed among office workers), and in selective demolition (where less importance is identified among office workers).

On the other hand, all three segments rate the phases of urban planning and building projects and the control and monitoring of the execution of works as the most important. And the phases that are attributed the least importance among the three segments analysed are: selective demolition, parks, gardens, waterworks and urban drainage, and the phase of electrical installations and lighting in buildings and urban areas.

As an overall result, averaging all the responses, the following table shows the scores obtained:

WORK PHASE	AVERAGE
1. Urban planning and building projects	**4.74**
2. Control and monitoring of the execution of works	**4.63**
3. Thermal insulation, acoustic insulation and waterproofing of buildings	4.47
4. Exterior carpentry and solar protection	4.32
5. Sealing of joints and seals	4.12
6. Renewable energy production facilities	3.89
7. Cooling, heating and hot water installations	4.11
8. Electrical and lighting installations in buildings and urban areas	3.63

9. Parks, gardens, waterworks and urban drains	3.34
10. Maintenance of buildings and urban facilities	3.98
11. Selective demolitions	3.23
12. Waste management on construction sites	3.85

Table 47. Prepared by the authors based on the average score per phase obtained by the experts who participated in interviews and expert groups.

This result shows that all construction phases have an average of more than 3 out of a possible score of 1 to 5, which means that all construction phases are very relevant for efficient building.

The two phases with the highest average are those directly related to the construction project: Urban planning and building projects, and project control and monitoring. And the two work phases with the lowest average are: Selective demolitions, and Parks, gardens, waterworks and urban drainage.

In order to continue with the next stage of analysis, the phases of work have been grouped together to simplify the process of identifying relevant and emerging occupations and skills for the construction sector to meet the 2030 Goals. Thus, the designations of the work phases and their average scores are as follows:

WORK PHASE	AVERAGE SCORES
1. Design, control, and monitoring of works execution	4.69
2. Action on the building envelope	4.30
3. Green actions in the building/environment	3.48
4. Renewable energy production installations/Heating and cooling/Domotics	4.00
5. Building maintenance	3.98
6. Demolition and waste management	3.54

Table 48. Grouping of work phases.

Identification of emerging and relevant occupational profiles to achieve the 2030 Goals

The next step was to associate the most relevant and emerging occupations in construction with each phase of work in order to achieve the 2030 Goals.

Thus, considering into account the construction phases, the most relevant occupations for energy efficiency were identified. For this part, there are two types of results: an assessment of the relevance of the occupation for sustainable construction (more traditional in nature), and the identification of relevant current profiles.

The occupational profiles were then sorted according to the work phases grouped together in the previous step. The table shows the result of two expert panels conducted to assess the relevant occupations, distinguishing between: white-collar staff and blue-collar staff.

In the case of white collars, there is no score on the concept of "relevance", as relevant occupations were asked.

However, in the group of blue collars, the information on occupations already identified in this segment of the BUILD UP Skills I and Construction Blueprint projects was used, so that a list of occupations and skills was provided and these could be quantitatively assessed. The assessment of the experts dealing with this segment of construction site workers was conducted on the importance of the different occupations on a construction site in relation to EE and EERR. To do so, they were asked to rate the level of belonging to and acceptance of each occupation or speciality in order to meet the 2030 climate and energy goals in Spain.

WORK PHASE	OCCUPATIONAL PROFILES	RELEVANCE AVERAGE
1. Design, control, and monitoring of the works execution	Building designer	4.9
	Installation designer	4.2
	Urban planner	2.8
	Construction manager	4.6
	Foreman	4.3
2. Performance in the building envelope	Thermal insulation, acoustic insulation and waterproofing of buildings installer	5.00
	Installer of carpentry and exterior prefabricated opaque and translucent elements.	4.11
	Specialist in sealing of joints and seals	3.67
3. Green actions in the building/environment	Installation designer	2.6
	Urban planner	4.8
	Building designer	4.8
	Landscape fitter, plant elements associated with buildings	3.44
	Green façade installer	2.89
	Green roof installer	3.00
4. Renewable energy production installations/Heating and cooling/Domotics	Installation designer	5
	Energy auditor	4.5
	Smart meter installer	3.44

WORK PHASE	OCCUPATIONAL PROFILES	RELEVANCE AVERAGE
	Installer of home and building automation management systems	4.11
	Heat pumps/aerothermics installer	5.00
	Photovoltaic cells installer	4.67
	Solar thermal cell installer	4.22
	Biomass thermal installations installer	3.63
	Building Ventilation Systems Installer	4.33
5. Building maintenance	Energy auditors	3.3
	Building designer	3.6
	Installation designer	4.2
	Specialist in control, inspection, collection and management of data related to energy efficiency.	4.38
6. Demolition and waste management	Installation designer	1.7
	Building designer	3.1
	Foreman	4.6
	Specialist in selective demolition, valuation and recycling of construction waste and construction elements.	3.33

Table 49. Identification of emerging and relevant occupational profiles to achieve the 2030 Goals. Source: Prepared by the authors based on the results of the "training needs" focus groups.

In the table above it can be identified how all the occupational profiles exceed the average of the ratings. The occupations referring to the specialities of Installation of thermal insulation of buildings, Installations of renewable energy production, heat pumps and aerothermic energy, and Installations of photovoltaic cells obtain the highest rating.

On the second level, with a relevance rating of 4 are positioned those referring to Specialists in Airtightness, Installation of building ventilation systems, Installation of carpentry and exterior prefabricated opaque and translucent elements, specialists in domotic and immotic management systems, Solar thermal cell installations, Biomass thermal installations, specialists in Control, inspection, collection and management of data related to energy efficiency, and the transversal digital and waste management skills.

On the third level, with a relevance ratings of 3 are those relating to specialists in smart meters - electrical engineering, green roofs, green façades, specialists in the installation of gardens, plant elements

associated with buildings, and selective demolition, valuation and recycling of construction waste and construction elements.

Emerging occupational profiles

In addition to establishing the importance of each of the profiles implicit in each of the phases of the construction process analysed above, other **emerging** and relevant profiles emerged in the discourse with the experts in order to achieve the objectives related to EE and EERR.

These can be differentiated into two levels:

- Profiles corresponding to the segment of office workers:
    - **Rehabilitation manager (of the energy process):** Profiles with management skills from various approaches and dealing with different players, such as the management of financing in connection with the construction companies that execute, with the city councils (they have the funds), they must work with households (who are the ones who are going to have to renovate their dwellings and who also have to be the starting point because they have to apply for these grants); also with the residents' associations they must be management profiles, but with technical knowledge. There is currently a Master's degree that provides the necessary knowledge for the job: Master's Degree in Environment and Bioclimatic Architecture. Some experts point out the need to have this profession at a level "close" to society, with municipal offices as a one-stop shop offering this service.
    - **Energy community manager:** occupational profile with a multidisciplinary character: knowledge of regulations and construction techniques and, at the same time, communication skills with the user. It is identified as a relevant occupation in order to be able to aggregate the demands for building rehabilitation at neighbourhood level, for example.
    - **Experts in energy certification:** Although there are currently professionals who meet this occupational profile, there is agreement that building energy certification processes should be more rigorous.
- Profiles corresponding to the construction workers segment:
    - **Specialists in building structures:** of formwork or alternative systems, of structures that do not involve the massive use of concrete or that use reused concrete.

Construction is evolving in new constructive forms in building and dwelling. This leads to the emergence of new specialities in order to apply these new building materials with energy efficiency or information technology. One example is the installation of solar panels or home domotics. New profiles in the

construction sector range from a bricklayer to other jobs specialising in digitalisation or telecommunications engineering.

The construction industry is immersed in a transformation process on a par with other 4.0 industries and needs a high percentage of its workers to acquire these skills. Innovation in processes, materials, tools and programmes is the main driver of the sector's progress.

However, we must consider that these new profiles are absolutely complementary and the result of innovation and the continuous improvement of construction processes. The essential concept is to understand the whole process in a fully collaborative way, with shared and well-defined objectives. From here, each participating agent introduces knowledge and experience for the benefit of the project, minimising inefficiencies and optimising the necessary resources.

In office (office/study)

Perception that it is getting better, as engineering schools or faculties or schools of architecture are putting a lot of focus on this issue. With the approval of the Technical Building Code, many schools converted many years ago and practically the syllabus was the technical building code and it includes a part on energy efficiency, so in theory it is a subject that is covered.

In addition, we can see how there are official tools provided by the Ministry, such as the **C3X** programme for the **certification of buildings** of new construction. Other **advanced energy simulation** programmes that are not recognised for certification by the Ministry, e.g. **Cocerm** or **Open studio**, but there are few professionals who are trained in this area. There is a lot of demand, but for sustainability certifications, large developments such as the buildings we are going here in the area that want to obtain Led certification or Breeam or Passive house certification, and there are not so many trained workers. And such professionals who can certify these private sustainability seals are in high demand.

On site

Perception that the most demanded profiles are those referring to **installers** (there are increasingly more advanced products, in terms of efficiency, but installers do not know how to handle/install them correctly) → Authorised installers (trained by manufacturing companies). The materials that work with energy efficiency are often so special that specialised training is necessary, as is required for electrical installation or other types of installations. There is a need to change the thinking, as specialisation is now being worked on to a greater extent in construction than was previously the case. However, we should not forget that this approach is not completely ideal, as it should not be forgotten that it is necessary to prioritise making the building itself efficient, rather than talking about using RES-E to achieve this.

One of the positions for which there are fewer and fewer professionals is that of **foreman**, a profession who plays a decisive role in the control and organisation of the rest of the site personnel, and who can also exercise this control that the execution is being conducted within the parameters of the EE and EERR.

The wood sector. Wood plays an important role because it is one of the most common materials used in buildings. The timber sector needs to recruit 60,000 workers in the coming years.

Young profiles

The most important element is to make the sector attractive, attractive from different dimensions: economic, working conditions, stability, job expectations, etc.

Across all the most in-demand positions are the use of new technologies, the ability to work as part of a team, and the ability to work in multidisciplinary teams.

On the other hand, in the review of secondary sources, other emerging occupations have been identified, in addition to those already mentioned. The study "Employment and ecological transition. Employment sources, labour transformation and training challenges in sectors related to climate change and biodiversity in Spain" (2023), the following are listed as emerging occupations**: Financial technician with specialisation in installations; Expert in the design of business models in the circular economy and Ecodesigner**. These occupations would correspond to while-collar profiles with a university education (EQF levels 6-8).

According to the same study, the **potentially most in-demand occupations** in order to achieve the 2030 Climate Goals are Design technician, architect or engineer specialising in energy efficiency and construction worker at all skill levels; Technical staff and operators who can conduct the subsequent emission controls and air quality analysis/calculations of these buildings (to bring them into compliance with regulations).

The annual reports of "**Prospection and Detection of Training Needs**", in the section on trends and forecasts for the different occupational families, present the following emerging occupations as a consequence of the new techniques and materials that appear. The following occupations are recorded in the 2022 and 2023 publications, corresponding to profiles of EQF levels 3-5:

BUILDING AND CIVIL WORKS	ENERGY AND WATER	INSTALLATION AND MAINTENANCE	AGRICULTURAL
Zero Emissions Construction Worker, Zero Building Consumption	Installer of organic material photovoltaic modules (OPCV) or graphene modules	Workers for the improvement of the energy efficiency of installations	Sustainable landscape development
Renewable energy installation and implementation technician	Solar energy installation designer	Workers in the automation of refrigeration and air conditioning systems	Urban gardens
Industrialised construction worker	Installer of more efficient equipment with the use of renewable energy	Installer of more efficient equipment adapted to the use of renewable energy	

	Solar thermal and photovoltaic solar installer	Solar thermal and photovoltaic installations.	

Table 50. Occupations registered in the report "Prospecting and Detection of Training Needs", of the SEPE. 2022 and 2023 publications. Source: Prepared by the authors from data of SEPE (National Statistics Institute).

Identifying skill needs to achieve the 2030 Goals

The following tables present the quantitative results from the fieldwork conducted. Each table corresponds to the professional profile identified previously and includes:

- **General Information:** National Classification of Occupations (CNO) code (in direct correspondences), phase of construction linked to the profile, EQF competence level of the profile, and mandatory training requirements.
- **Training Needs:** An assessment of the extent to which the relevant competencies for these profiles are present on site.
- **Experts evaluated a set of pre-designed competencies on a scale from 1** (very little presence on site) **to 5** (strong presence on site). The results are interpreted such that lower presence on site indicates a greater need for training. This document only reflects the average scores below 3, a threshold considered indicative of the need for training in that particular competency.
- **Other Relevant Competencies Identified:** Additional training needs beyond the predefined list.
- **Other Relevant Data:** Additional information relevant in the national context.
- **Relation to the Construction Blueprint Project:** Information on the most relevant training needs for non-university profiles that align with those studied in the Construction Blueprint project. The complementarity of these competencies will contribute to the learning outcomes considered in the Roadmap configuration.

BUILDING DESIGNER		
CNO 2451 | 2481 | 2432	**CONSTRUCTION STAGE:** 1 | 2 | 3 | 4 | 5 | 6	**EQF LEVEL:** 6
TRAINING	Architecture, Technical Architecture, Building, Building Engineering	

TRAINING NEEDS	SCORE
Knowledge of building life cycle analysis	2.2
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED	
Design of specific passive solutions for each project based on the local climate (orientation, interior layout, positioning of openings, and solar protections)	
Selection of locally sourced construction materials that involve responsible transportation	
Selection and design of construction systems that meet sustainability criteria - implementation	
Selection and design of construction systems that meet sustainability criteria - maintenance	
Design of nearly zero-energy buildings	
Determination of compatibility and coherence between passive solutions, sustainable construction systems, and efficient installations	
OTHER INFORMATION OF INTEREST	

Table 51. Identification of the training needs of the building designer professional profile. Source: Prepared by the authors based on the results of the Field Study.

INSTALLATION DESIGNER		
CNO: 2431, 2432, 2441, 2462, 2469, 2471	**CONSTRUCTION STAGE:** 1 | 2 | 3 | 4 | 5 | 6	**EQF LEVEL:** 6
TRAINING	Engineering	
TRAINING NEEDS		**SCORE**
--		--
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED		
Maintenance plan for the installations		
Optimisation of installations and renewable production systems		
OTHER INFORMATION OF INTEREST		

Table 52. Identification of the training needs of installation designer professional profile. Source: Prepared by the authors based on the results of the Field Study.

URBAN PLANNER		
CNO: 2453	**CONSTRUCTION STAGE:** 1 | 3	**EQF LEVEL:** 6
TRAINING	Architecture, Technical Architecture, Building Construction	

TRAINING NEEDS	SCORE
Providing efficient water management solutions	2.5
Designing projects and performing calculations for drainage systems	2.9
Identification of interventions and improvements	2.9
Current knowledge of materials and various construction systems	2.6
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED	
Design of passive solutions that enhance thermal inertia in the city	
Selection and design of construction systems that adhere to sustainability criteria during implementation	
OTHER INFORMATION OF INTEREST	

Table 53. Identifying the training needs for the urban planner professional profile. Source: Prepared by the authors based on the results of the Field Study.

FOREMAN		
CNO: 3202	**CONSTRUCTION STAGE:** 1 | 2 | 3 | 4 | 5	**EQF LEVEL:** 5
TRAINING	Senior Degree in Building (recommended)	
TRAINING NEEDS		**SCORE**
Control of construction activities with a focus on energy efficiency		2.6
Carrying out activities established in quality and environmental management systems within the scope of middle management responsibilities on construction sites		2.6
Explaining the necessary instructions to achieve the energy efficiency level specified in the project, ensuring they are understood		2.8
Knowledge of circular economy		1.8
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED		
OTHER INFORMATION OF INTEREST	Occupation of special relevance, meeting point between the designers of the project and the operators and installers who execute the project. A profession that, due to the retirement of professionals, is becoming scarce.	

Table 54. Identification of the training needs for the foreman professional profile. Source: Prepared by the authors based on the results of the Field Study.

CONSTRUCTION MANAGER		
CNO: 3202	**CONSTRUCTION STAGE:** 1 | 2 | 3 | 4 | 5	**EQF LEVEL:** 6
TRAINING	Architecture, Building Construction, Engineering	

TRAINING NEEDS	SCORE
--	--
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED	
Selection of local construction material suppliers that involve responsible transportation	
Ability to choose implementation systems that minimise the use of consumable resources (electricity, water, etc.)	
OTHER INFORMATION OF INTEREST	

Table 55. Identification of training needs for the construction manager professional profile. Source: own elaboration based on field study results.

ENERGY AUDITOR		
CNO: Unidentified	**CONSTRUCTION STAGE:** 1 | 2 | 3 | 4 | 5	**EQF LEVEL:** 6
TRAINING		
TRAINING NEEDS		**SCORE**
--		--
ADDITIONAL RELEVANT COMPETENCIES IDENTIFIED		
Determination of compatibility and coherence between passive solutions, sustainable construction systems, and efficient installations		
Supervision during the execution of the thermal envelope		
Supervision during the installation implementation		
Analysis of energy consumption during the project phase		
Analysis of actions in energy rehabilitation		
OTHER INFORMATION OF INTEREST		

Table 56. Identification of training needs for the construction manager professional profile. Source: own elaboration based on field study results.

As mentioned above, the structure of activities and skills established in the **Skills Observatory for the Construction Sector** was used to identify the training needs of occupational profiles at EQF level 3-5. This Observatory shows through interactive charts the skills gaps in the construction sector in three areas: digitalisation, energy efficiency and circular economy. In this Status Quo, the specialities and skills related to energy efficiency have been considered.

Figure 10. Specialities in energy efficiency analysed in the Skills Observatory for the construction sector. Source: Skills Observatory for the construction sector.

For the development of this Status Quo, the same specialities have been assessed (insulation, airtightness, ventilation, etc.) by conducting an assessment of the same skills that make up each speciality, complemented, if appropriate, with national casuistry. In this way, the experts assessed the level of presence of each professional skills in the labour market today. To do this, they were asked to use a scale from 1 to 5, where 1 is "Not present at present at all" to 5 "Fully present at present". In other words, the lower the level of presence, the greater the skills gap and therefore the greater the need for training.

Although, for reasons of space, it is not possible to include the direct information from the Observatory, where possible, the similarities or differences with the results of the field study conducted for the Status Quo are indicated for each occupational profile.

As an example, in the case of the occupational profile Installer of thermal insulation:

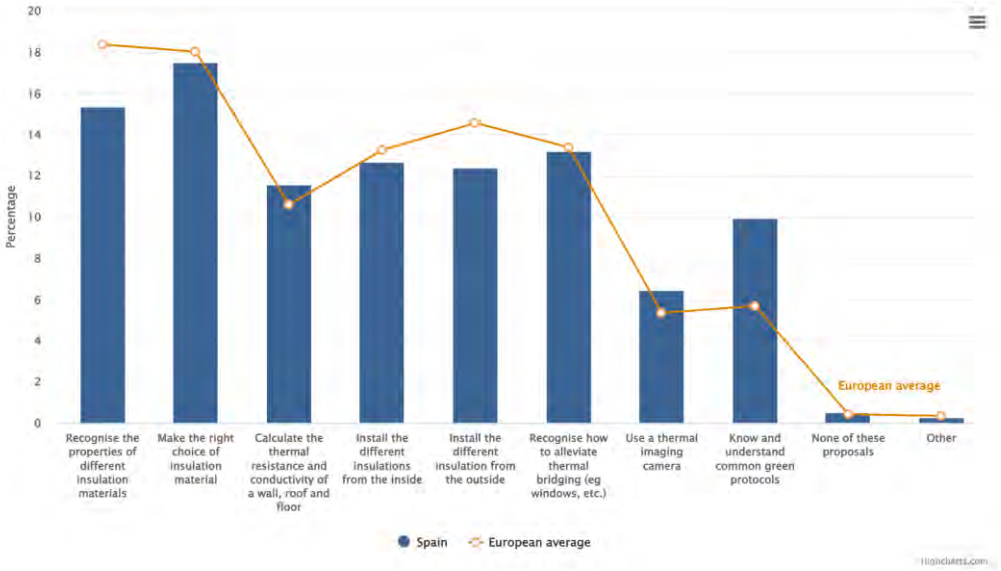


Chart 33. Skill needs (EQF levels 3-5) in Spain for thermal insulation. Source: Skills Observatory for the construction sector.

According to the results of the Observatory, in Spain, the greatest skill needs for this profile are: making a correct selection of insulation material, recognising the properties of insulation materials and knowing how to solve thermal bridges. Compared to the skills needs in Europe, it is considered less necessary to recognise the properties of insulation materials. In addition, it is considered more necessary to know and understand common protocols.

Another example, concerning the aerothermics or heat pump installer (occupational profile denomination in the Status Quo), the results of the skills needs are the following:

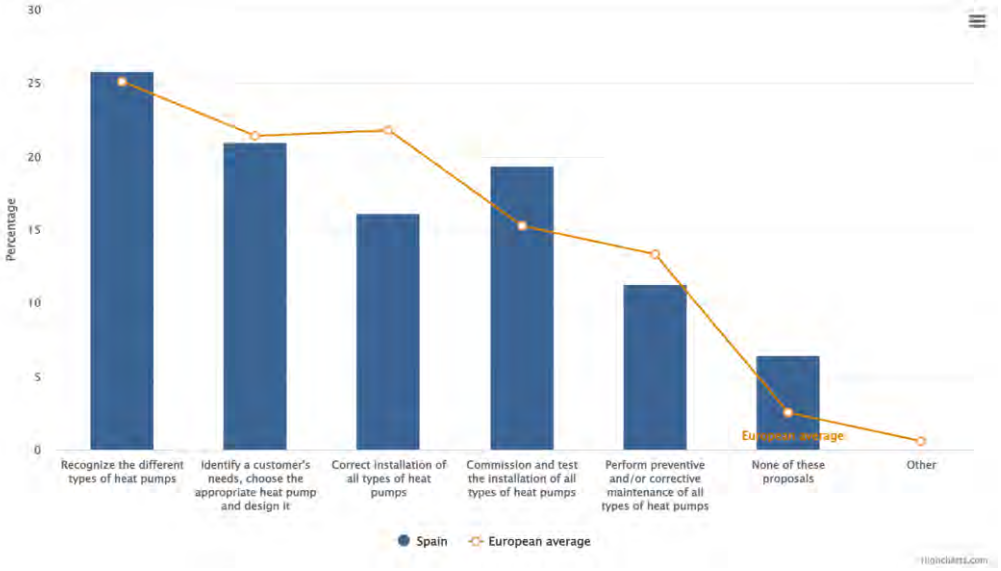


Chart 34. Skill requirements (EQF levels 3-5) in Spain for heat pump installation. Source: Skills Observatory for the construction sector.

The results of the Observatory indicate that the most important skill needs of aerothermics or heat pumps installers are: recognising the different types of heat pumps; choosing and designing the right heat pump according to the customer's needs; and purchasing and testing different types of heat pumps. Compared to the skills needs in Europe, it is considered more necessary to procure and test different types of heat pumps. At the same time, it is considered less necessary to know how to install different types of heat pumps correctly.

Finally, the results of the Observatory concerning the skills needs of the specialist in home and building automation management systems are as follows:

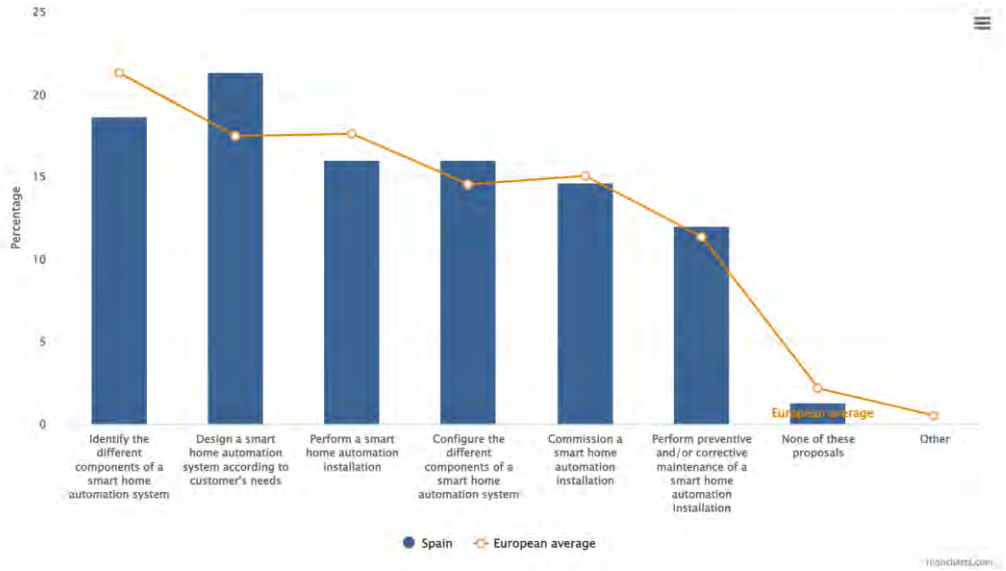


Chart 35. Skills needs (EQF levels 3-5) in Spain in home domotics. Source: Skills Observatory for the construction sector.

The results of the Observatory indicate that the greatest skill needs of the home and building automation management system specialist in Spain are respectively: knowing how to design home and building automation management systems according to customer needs and knowing how to identify the different components. At the European level, the order is reversed: it is considered more necessary to know how to identify the different components of home and building automation management systems according to customer needs than to know how to design the systems.

The following tables show the occupational profiles and those skills that scored below 3 points and are considered to be in need of training.

INSTALLER OF THERMAL INSULATION OF BUILDINGS		
CNO: 7292	**CONSTRUCTION STAGE:** 2	**EQF LEVEL:** 4
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations	
TRAINING NEEDS		**SCORE**
Recognising the properties of different insulation materials		2.56
Proper receipt, unloading and stockpiling of insulation material to avoid errors in material and product selection and spoilage		2.75
Installing the different types of insulation from the inside: sprayed insulation, cavity filler and wall cladding		2.67
Installing the different insulation systems from the outside: forecast, SATE using panels and ventilated façades		2.00

Installing insulation in singular areas, adequately resolving the joints to avoid or reduce the appearance of thermal bridges (for example, in window jambs, joints with the structure, etc.)	2.13
Knowing and understanding standard environmental protocols, including those relating to waste reduction and management	1.75
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	**The main skill needs for this profile are:** making the correct selection of insulation material, recognising the properties of insulation materials and knowing how to overcome thermal bridges

Table 57. Identification of the training needs of the occupational profile Installer of thermal insulation for buildings. Source: Prepared by the authors based on the results of the Field Study.

INSTALLER OF CARPENTRY AND EXTERIOR PREFABRICATED OPAQUE AND TRANSLUCENT ELEMENTS		
CNO: 7132	**CONSTRUCTION STAGE /NACE:** 2	**EQF LEVEL:** 3-4
TRAINING	Advanced technician in installations and furnishing (recommended)	
TRAINING NEEDS		**SCORE**
Signalling the preparation of openings, as well as the fitting, setting out or adjustment of carpentry and other elements to the opening		2.14
Sealing of joints between precast elements and openings		2.43
Install façade solar protection elements, adequately resolving joints and connections with other elements to reduce or avoid the appearance of thermal bridges		2.29
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HE and DB-HS)	

Table 58. Identification of the training needs of the occupational profile Installer of carpentry and exterior prefabricated opaque and translucent elements. Source: Prepared by the authors based on the results of the Field Study.

WATERTIGHTNESS SPECIALIST		
CNO: 7221	**CONSTRUCTION STAGE /NACE:** 2	**EQF LEVEL:** 3-4
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations	
TRAINING NEEDS		**SCORE**
Identifying the watertightness requirements from the interpretation of the data of the execution project and other technical documents		1.50
Performing an air tightness test following an appropriate checklist		1.38
Identifying the points of leakage of the building, and the properties of the different products and materials		1.38

SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main skill needs for this profile are: the correct installation of products and materials related to airtightness, recognising the properties of different products and materials related to airtightness, performing airtightness tests, drawing up appropriate checklists, and measuring the airtightness of buildings
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HS)

Table 59. Identification of the training needs of the occupational profile watertightness specialist. Source: Prepared by the authors based on the results of the Field Study.

GREEN ROOF INSTALLER		
CNO: 7121 | 7221 | 7193 | 6120	**CONSTRUCTION STAGE:** 3	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations. Senior-level Technician in Landscaping and the Rural Environment. Technician in Gardening and Floristry, Senior-level Technician in Landscaping and the Rural Environment.	
TRAINING NEEDS		**SCORE**
Checks prior to execution, this includes: work equipment (machines, tools, tools, protective equipment, ancillary means, etc.), preparation of the site, definition of the scope of the work, support and environmental conditions, materials to be used		1.57
Reception, unloading and stockpiling of materials and products to be used on the roof		1.57
Laying of waterproofing, separating and protective layers, drainage system, filtering system and other layers required in the project		1.86
Execution of singular points on the roofs: meetings with parapets and other vertical elements, files, etc.)		1.57
Installation of rainwater drainage elements		2.00
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HS)	

Table 60. Identification of the training needs of the occupational profile Green roof installer. Source: Prepared by the authors based on the results of the Field Study.

GREEN FAÇADE INSTALLER		
CNO: 7292 | 7192 | 6120	**CONSTRUCTION STAGE:** 3	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations. Senior-level	

	Technician in Landscaping and the Rural Environment. Technician in Gardening and Floristry, Senior-level Technician in Landscaping and the Rural Environment
TRAINING NEEDS	**SCORE**
Determination of the scope of the work to be carried out and identification of the characteristics of the support and the elements of the plant façade system, by consulting the relevant information and interpreting the specific technical documentation (exploded/modulation and assembly drawings, manufacturers' technical instructions)	1.67
Checking the characteristics and properties of the substrate	1.67
Correct use of the necessary work equipment (machines, tools, tools, auxiliary and protective equipment)	1.83
Conditioning of pits to improve yields and avoid risks in the installation of plant façades	1.83
Reception, unloading and stockpiling of materials and products to be used in the façade	2.17
Staking out of references for the positioning of the anchoring subsystem elements (fixings and/or supporting substructure of the cladding) and the singular elements of the façade (window openings, mouldings, parapets, eaves...).	1.83
Waterproofing and laying and fixing of insulation boards, if required by the system	1.83
Positioning and attachment to the support of the anchoring subsystem and/or supporting substructure of the substrate containers	1.83
Attachment/attachment of substrate parts or containers to the anchoring subsystem and/or supporting substructure	1.83
Placement of singular or finishing elements to resolve discontinuities in the façade (gaps, plinths, edges...)	1.67
Complementary work to complete the work (cleaning, sealing, joint treatment, etc.).	1.83
OTHER INFORMATION OF INTEREST	Affects several occupations (waterproofing, gardener, plumber).

Table 61. Identification of the training needs of the occupational profile Green façade installer. Source: Prepared by the authors based on the results of the Field Study.

SMART METER INSTALLER		
CNO: 7294	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations.	
TRAINING NEEDS		**SCORE**
Identifying the different types of smart meters		1.50
Installing a smart meter		1.75

Setting the different parameters of a smart meter	1.50
Commissioning an installation with a smart meter	1.63
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main skill requirements for this profile are: identifying the different types of smart meters, adjusting the different types of parameters of a smart meter, commissioning a smart meter installation, performing the installation of a smart meter

Table 62. Identification of the training needs of the occupational profile Home domotics installer. Source: Prepared by the authors based on the results of the Field Study.

BUILDING VENTILATION SYSTEMS INSTALLER		
CNO: 7250	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations.	
TRAINING NEEDS		**SCORE**
Differentiating the main types of ventilation in buildings		2.38
Identifying the installation requirements of ventilation systems from the interpretation of drawings and other technical project documents		211
Preparing the layout of the ductwork and identifying the location of the elements of the ventilation system		2.75
Correctly installing the various components of the ventilation system		2.88
Sealing the joints between the ventilation system ducts and floors, partitions and walls		2.38
Conducting final installation and commissioning checks		2.75
Conducting preventive and corrective maintenance of building ventilation installations		2.50
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main skill needs for this profile are: insulation, ventilation, photovoltaics, sealing, heat pumps, solar thermal energy, aerothermal energy, geothermal energy, home domotics, biomass and wind energy	
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HS)	

Table 63. Identification of the training needs of the occupational profile Installer of building ventilation systems. Source: Prepared by the authors based on the results of the Field Study.

HEAT PUMPS /AEROTHERMICS INSTALLER		
CNO: 7250	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5

TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations.

TRAINING NEEDS	**SCORE**
Recognising the different types of heat pumps and their relationship with the rest of the components of the air-conditioning system	2.22
Proper receipt, unloading and stockpiling of equipment to avoid sorting errors and spoilage due to deterioration	2.75
Correct installation of all types of heat pumps	2.67
Sealing the joints between the ventilation system ducts and floors, partitions and walls	2.13
Performing preventive and/or corrective maintenance of all types of heat pumps	2.50
Commissioning and testing of the installation of all types of heat pumps	2.75

SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main requirements for this profile are: identifying the different types of heat pump/aerothermal systems, identifying customer needs, designing and choosing the right heat pump/aerothermal system, commissioning and testing the installation of all types of heat pumps/aerothermal systems, correct installation of all types of heat pumps/aerothermal systems, conducting preventive maintenance of all types of heat pumps/aerothermal systems
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HE)

Table 64. Identification of the training needs of the occupational profile Heat pump/aerothermics installer. Source: Prepared by the authors based on the results of the Field Study.

INSTALLER OF BIOMASS THERMAL INSTALLATIONS		
CNO: 7250	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations.	

TRAINING NEEDS	**SCORE**
Identifying the different components of an installation using biomass energy	2.13
Identifying biomass installation requirements from the interpretation of plans and other technical project documents	2.13
Configuring the different components of a biomass energy plant according to the customer's needs	2.25
Installing a biomass-powered installation	2.38
Commissioning a biomass energy plant	2.50
Preventive and/or corrective maintenance of a biomass-fuelled installation	2.25

SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main requirements for this profile are: to realise an installation using biomass thermal energy, to configure the different components of a biomass thermal installation according to the customer's needs, to identify the different components of a biomass thermal installation.
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HE).

Table 65. Identification of the training needs of the occupational profile Biomass thermal installer. Source: Prepared by the authors based on the results of the Field Study.

ENERGY AUDIT TECHNICIAN		
CNO: Not identified	**CONSTRUCTION STAGE:** 5	**EQF LEVEL:** 5
TRAINING	**VET/Cycle (required):** Specialisation course in Energy Auditing	
TRAINING NEEDS		**SCORE**
Conducting data collection and measurements of energy consumption in a building		2.00
Checking the efficiency of energy installations in buildings		2.00
Making proposals for the improvement of the energy efficiency of building installations		2.13
Drawing up documents justifying compliance with energy saving and efficiency requirements		2.13
OTHER INFORMATION OF INTEREST	Occupation related to the regulatory framework established in the Technical Building Code (CTE DB-HE)	

Table 66. Identification of the training needs of the occupational profile Energy audit technician. Source: Prepared by the authors based on the results of the Field Study.

SPECIALIST IN DOMOTIC AND INMOTIC AUTOMATION MANAGEMENT SYSTEMS		
CNO: Not identified	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Basic-level vocational qualification in electricity and electronics, electrical and automatic installation technician, telecommunications installation technician, Senior-level Technician in electronic maintenance, Senior-level Technician in electro-technical and automated systems	
TRAINING NEEDS		**SCORE**
Identifying the different components of a smart domotics system		1.78
Identifying the installation requirements of home and building domotic and inmotic systems based on the interpretation of the plans and other technical documents of the project		1.67
Installing a home domotics system		1.89
Configuring the different components of a domotic system		1.89
Sealing the joints between the ventilation system ducts and floors, partitions and walls		1.50

Starting up a home domotics installation	2.00
Conducting preventive and/or corrective maintenance of a home domotics installation	2.00
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main requirements for this profile are: to identify the different types of smart meters, to adjust the different types of parameters of a smart meter, to order a smart meter installation, to install a smart meter.

Table 67. Identification of the training needs of the occupational profile Specialists in home and building domotics management systems. Source: Prepared by the authors based on the results of the Field Study.

SMART METER TECHNICIAN		
CNO: Not identified	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Basic-level vocational qualification in electricity and electronics, electrical and automatic installation technician, telecommunications installation technician, Senior-level Technician in electronic maintenance, Senior-level Technician in electro-technical and automated systems.	
TRAINING NEEDS		**SCORE**
Identifying the different types of smart meters		1.50
Installing a smart meter		1.75
Setting the different parameters of a smart meter		1.50
Commissioning an installation with a smart meter		1.63
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main requirements for this profile are: to identify the different types of smart meters, to adjust the different types of parameters of a smart meter, to order a smart meter installation, to install a smart meter.	
OTHER INFORMATION OF INTEREST		

Table 68. Identification of the training needs of the occupational profile Smart meters technician. Source: Prepared by the authors based on the results of the Field Study.

PHOTOVOLTAIC SOLAR CELL INSTALLER		
CNO: 7294	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations**.**	
TRAINING NEEDS		**SCORE**
Identifying photovoltaic installation requirements from the interpretation of drawings and other technical project documents.		2.56

Building installations with photovoltaic cells	2.88
Performing preventive and/or corrective maintenance of an installation including photovoltaic cells.	2.78
SKILLS NEEDS IDENTIFIED IN THE CONSTRUCTION BLUEPRINT PROJECT	The main requirements for this profile are: Identifying the different components of a photovoltaic installation, configuring the different components of a photovoltaic solar cell installation according to customer requirements, conducting the installation of photovoltaic solar cells, conducting the maintenance of an installation including photovoltaic solar cells, building an installation with photovoltaic solar cells.

Table 69. Identification of the training needs of the occupational profile Photovoltaic solar cell installer. Source: Prepared by the authors based on the results of the Field Study.

SOLAR THERMAL CELL INSTALLER		
CNO: 7294	**CONSTRUCTION STAGE:** 4	**EQF LEVEL:** 3-5
TRAINING	**VET/Cycle (recommended):** Technician in Construction, Technician in Electrical and Automatic Installations, Technician in Heat Production Installations, Technician in Refrigeration and Air Conditioning Installations.	
TRAINING NEEDS		**SCORE**
Identifying solar thermal installation requirements from the interpretation of drawings and other technical project documents		2.75
Installing a system including solar thermal cells		2.88
Commissioning a system with solar thermal cells		2.88
Performing preventive and/or corrective maintenance of an installation including solar thermal cells		2.88
OTHER INFORMATION OF INTEREST		

Table 70. Identification of the training needs of the occupational profile Solar thermal cell installer. Source: Prepared by the authors based on the results of the Field Study.

SPECIALIST IN SELECTIVE DEMOLITIONS, VALUATION AND RECYCLING OF CONSTRUCTION WASTE AND CONSTRUCTION ELEMENTS		
CNO: 7121, 9602713, 751, 722, 7111, 8331, 7231721, 719	**CONSTRUCTION STAGE:** 6	**EQF LEVEL:** 3-5
TRAINING	High-level technician in civil works projects (recommended)	
TRAINING NEEDS		**SCORE**
Removal of household goods together with doors, windows and non-opaque elements from the façade and roof		2.75

Removal of wiring and other elements of electrical and telecommunication installations	2.75
Removal of plumbing fixtures, fittings and sanitary ware	2.88
OTHER INFORMATION OF INTEREST	

Table 71. Identification of the training needs of the occupational profile a specialist in selective demolitions, valuation and recycling of construction waste and construction elements. source: Prepared by the authors based on the results of the Field Study.

In addition to these technical skills, the analysis of the discourse in the focus groups recognises a need for **cross-cutting skills**, which affect all occupations in the sector, and which should be promoted in the different curricula of courses or other means, such as promotional campaigns:

- General knowledge related to the environment and sustainability.
- Technical or activity-specific skills that enable occupations to adopt to the ecological transformation of the construction and related sectors.
- Cross-sectoral expertise.
- Digital skills.
- Communication with dwelling users.

Similarly, experts agree that training in the sector should be increasingly **specialised** and also **multi-disciplinary**, enabling an encounter with other productive sectors and varied profiles (white collar and blue collar).

It is also necessary to include, in general, **new construction schemes** such as industrialisation, or **new digital tools**, such as BIM. New tools such as industrialisation will allow personnel not only to have a training base and work experience related to construction but will also offer training to very varied and heterogeneous profiles.

As mentioned throughout this report, construction geared towards meeting the 2030 Objectives is an employment opportunity due to the emergence of new occupational profiles (related to energy audits, installation of new construction systems, etc.). In this change, the re-skilling of workers in the sector is also key, so that they can renew their skills to meet the needs of the companies. In this respect, some focus group participants have mentioned that, in the long term, experts will be needed in new renewable energy alternatives such as hydrogen or ammonia, and the applications that can be made in the construction and related sectors.

Quantification of energy efficiency and renewable energy workers by economic activity

In the following chart, you can see the percentage range of people working in the sector who can be directly related to energy efficiency and the use of renewable energy. In this respect, around 42 % of workers in the construction and related sectors may be affected. However, the same chart shows that 60 % of the experts consulted state that this percentage is below 46 %, while 40 % of the experts consider it to be above 46 %.

If this percentage is analysed in evolution with that established in the Status Quo published in 2012, it can be seen how the results are very similar; the median response on the percentage of workers was around 26 % – 35 %, it was similar, with a tendency to increase in the future.

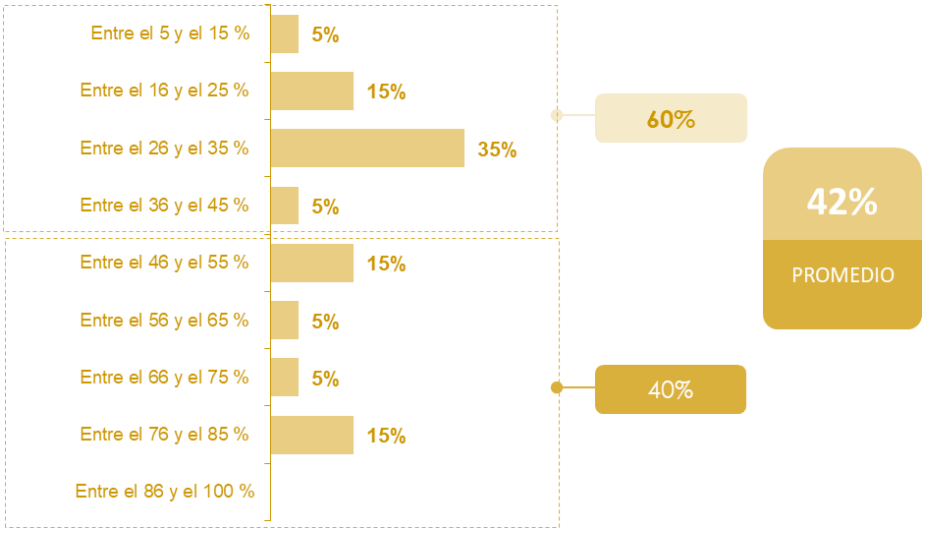


Chart 36. Percentage of workers in the sector who consider that they can be directly involved in energy efficiency and the use of renewable energy. Source: Fieldwork conducted for Status Quo.

In the present Status Quo, when considering the evolution of this percentage in the future, experts broadly agree that it will increase: 85 % of professionals consider that it will increase, while 15 % consider that it will remain stable.

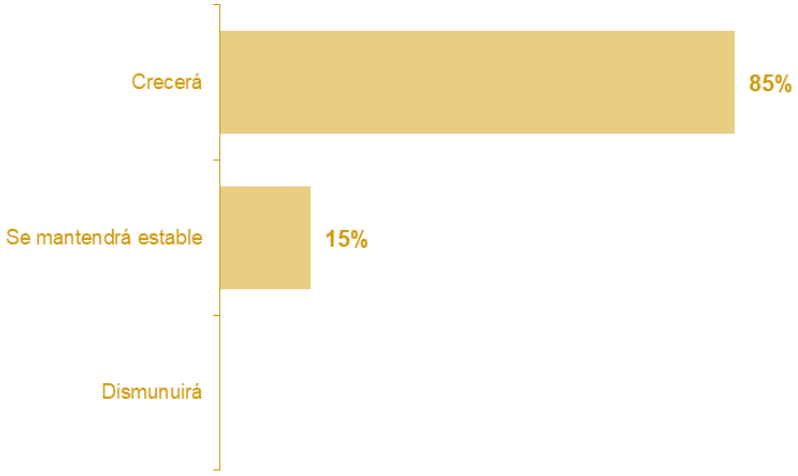


Chart 37. Estimation of the evolution of the percentage of workers in the sector who can be directly involved in energy efficiency and the use of renewable energy. Source: Prepared by the authors based on the analysis of the fieldwork conducted for the Status Quo.

The number of workers potentially linked to energy efficiency act in building construction (CNAE 411, 412), in specialised construction activities (CNAE 431, 432, 433, 439), and in architectural and engineering technical services, technical testing and analysis (CNAE 711 and 712). The total number of people working in these sectors is 1,471,381, considering that between 26 % and 35 % of the people working in the selected sectors are related to aspects of energy efficiency and the use of renewable energy[6] and between 382,559 and 514,983 people are in related positions.

SUB-SECTOR (3-DIGIT CNAE)	NUMBER OF WORKERS	
Building Construction (411, 412)	540,356	
Specialised construction activities (431, 432, 433, 439)	668,425	
Architectural and engineering services, technical testing and analysis (711, 712)	262,600	
Total number of workers in the building and associated sectors	**1,471,381**	
Percentage of workers linked to energy efficiency	26%	35%
Number of workers involved in energy efficiency	**382,559**	**514,983**

Table 72. Number of workers linked to energy efficiency by economic activity (CNAE). Source: Prepared by the authors based on the results of the field study and CNAE.

Quantification of training needs in energy efficiency and renewable energy

The number of professionals involved in energy efficiency by occupation is quantified below. For this purpose, the occupations with the strongest linkages have been selected on the basis of the information collected in the different techniques. These are detailed in the table by two main groups. These can be roughly divided between architects, engineers and other university technicians (with EQF levels 6, 7 and 8) on the one hand, and on the other hand, occupations related to middle managers, officials and installers (with EQF levels 3, 4 and 5).

GROUP OF WORKERS	MAIN OCCUPATIONS LINKED TO ENERGY EFFICIENCY AND RENEWABLE ENERGY	3-DIGIT CNO11

[6] CNAE included 411, 412, 431, 432, 433, 439, 711 and 712 since they are the companies whose business activity is linked both to the design and to the construction and rehabilitaicon of the building stock.

Architects, engineers and other university technicians	Engineers (except agricultural, forestry, electrical, electronic and ICT engineers), electrical, electronic and telecommunications engineers, architects, town planners and geographic engineers, technical engineers (except agricultural, forestry, electrical, electronic and ICT engineers), electrical, electronic and telecommunications technical engineers, technical architects, surveyors and designers.	243, 244, 245, 246, 247, 248
Middle management, officers and installers	Draftsmen and technical draughtsmen, Technicians in the physical, chemical, environmental and engineering sciences, Quality control technicians in the physical, chemical and engineering sciences, Supervisors in mining, manufacturing and construction engineering, Material recording clerks, Masons, stonemasons, stonecutters, stone cutters, stone cutters and engravers, Carpenters (except joiners and fitters of metal structures), Other workers in structural construction work, Plumbers and pipe fitters, Floor and parquet layers and related trades workers, Refrigeration and air-conditioning mechanics and fitters, Other finishing workers in construction, installation (except electricians) and related trades workers, Moulders, welders, sheet metal workers, structural metal workers and related trades workers, Blacksmiths and tool makers and related trades workers, Construction electricians and related trades workers, Other electrical equipment installers and repairers, Electronic and telecommunications equipment installers and repairers, Factory assemblers and assemblers	311, 312, 316, 320, 412, 711, 712, 713, 719, 722, 724, 725, 729, 731, 732, 751, 752, 753, 820, 833

Table 73. Percentage of workers with training needs in energy efficiency and the use of renewable energy by group of workers. Source: Prepared by the authors based on the results of the field study.

Based on LFS data and selected occupations, an estimated 41,094 architects, engineers and other university technicians are currently working in professions linked to energy efficiency and the use of renewable energy. In addition, an estimated 782,145 middle managers, officers and installers work in occupations linked to energy efficiency and the use of renewable energy.

GROUP OF WORKERS	NUMBER OF WORKERS IN MAIN OCCUPATIONS LINKED TO ENERGY EFFICIENCY AND THE USE OF RENEWABLE ENERGY
Architects, engineers and other university technicians	41,094
Middle management, officers and installers	782,145

Table 74. Percentage of workers with training needs in energy efficiency and the use of renewable energy by group of workers in the construction sector. Source: Prepared by the authors based on the results of the field study.

In the following table, you can see the range of training needs in energy efficiency and the use of renewable energy estimated in the field study. In this respect, experts estimate that between 66 % – 75 % of architects, engineers and other university technicians need additional training in energy efficiency and the use of renewable energy. At the same time, experts estimate that 76 % – 85 % of middle managers, officials and installers working in the sector need additional training.

GROUP OF WORKERS	PERCENTAGE
Architects, engineers and other university technicians (EQF 6, 7 and 8)	66 % – 75 %
Middle management, officials and installers (EQF 3, 4 and 5)	76 % – 85 %

Table 75. Percentage of workers with training needs in energy efficiency and the use of renewable energy by group of workers. Source: Prepared by the authors based on the results of the field study.

We can obtain an estimate of the number of workers to be trained in energy efficiency and renewable energy use by cross tabulating the number of workers in occupations and estimates of training needs. Thus, taking the experts' assessments by certainty, we estimate that between 27,122 and 30,821 architects, engineers and other university technicians (EQF 6, 7 and 8) have additional training needs in EE and the use of ER. Alternatively, between 594,430 and 664,823 middle managers, officials and installers (EQF 3, 4 and 5) have additional training needs in EE and RE.

GROUP OF WORKERS	ARCHITECTS, ENGINEERS AND OTHER UNIVERSITY TECHNICIANS (EQF 6, 7 AND 8)		MIDDLE MANAGEMENT, OFFICERS AND INSTALLERS	
Number of workers in main occupations linked to Energy Efficiency and the use of Renewable energy	41,094		782,145	
Percentage of workers with additional training needs in Energy Efficiency and use of Renewable energy	66%	75%	76%	85%
Total number of employees with additional training needs in Energy Efficiency and the use of Renewable energy	**27,122**	**30,821**	**594,430**	**664,823**

Table 76. Percentage of workers with training needs in energy efficiency and the use of renewable energy by group of workers. Source: Prepared by the authors based on the results of the field study.

Aggregating now the two large groups of workers studied, it is estimated that between 621,552 and 695,644 workers in the construction sector would have additional training needs in energy efficiency and renewable energy use. This would mean that the number of workers to be trained per year between 2023 and 2030 within the sector's workforce would be between 77,694 and 86,955 workers.

TOTAL TRAINING NEEDS IN ENERGY EFFICIENCY AND THE USE OF RENEWABLE ENERGY		NUMBER OF WORKERS TO BE TRAINED PER YEAR UNTIL 2030
Maximum number of employees with training needs	695,644	86,955
Minimum number of workers with training needs	621,552	77,694

Table 77. Percentage of employees with training needs in energy efficiency and the use of renewable energy by group of workers. Source: Prepared by the authors based on the results of the field study.

Quantification of the need for additional workforce of energy efficiency and renewable energy workers

The methodology for quantifying the workforce needed to achieve the 2030 Goals is described below.

- We identify the different goals under the "Long-term strategy for the energy rehabilitation in the construction sector in Spain. ERESEE 2020" and fully aligned with the National Integrated Energy and Climate Plan (PNIEC) 2021-2030. The main milestones affecting the construction sector are as follows:
    - It is expected that between 2021 and 2030 a total of 1,200,000 primary dwellings will be rehabilitated, equivalent to an investment of 15.560 billion euros. These will be implemented with 4.995 billion euros in public aid. It is expected that by 2050, 7.1 million dwellings will have been rehabilitated in depth, reducing unit consumption to 12 kWh/m2.
    - Between 2021 and 2030 a total of 1,367,040 new dwellings will be built, including main residence and non-main residences and replacement. Thus, it is assumed that the number of main residences will increase from 18,771,653 in 2020 to 20,017,505 in 2030, while the number of secondary and empty dwellings will decrease slightly from 6,375,471 to 6,282,148 in 2030. All newly constructed dwellings are assumed to be Nearly Zero Energy Buildings as they are built pursuant to the technical requirements in force from 2020.
    - Actions to replace thermal installations with more efficient ones involve the intervention of 384,529 installations annually. Between 2021 and 2030, a total of 3,845,000 thermal installations will be replaced, equivalent to an investment of 11,563 million euros. These will receive 2,313 million euros in public aid.
- We identify the level of employment of workers in the sector in 2020, prior to the implementation of ERESEE: 1,244,077, including both site and office workers. Since the increase in the workforce produced in building construction must be calculated counting the construction of new buildings and the energy rehabilitation of existing buildings, we calculate employment excluding the civil engineering sub-sector: 1,137,029 workers.
- We plan all the works to be completed in the future, including both new dwellings as well as in-depth rehabilitation. We also calculated the level of future employment within the sector in order to achieve the defined targets by assuming that the workforce is proportionally related to the number of new constructions and rehabilitations completed in the sector.
- The forecast estimate of total works completed is linked to the number of workers in 2020, implying that the current workforce is only 56% of the workforce needed to achieve the 2030 Goals.

- We incorporate in the estimates the employment already created since the launch of ERESEE until the latest available data (Q4 2023).

- We calculate the expansion rates for each profession using the number of students and graduates in university studies as well as VET. Here we present two different data sources to calculate the sector's expansion. On the one hand, there are the Randstad- Universidad San Pablo CEU estimates for the calculation of university graduates as well as data from the Ministry of Universities (UNIVbase). On the other hand, we use data from the Ministry of Education and the Vocational Education and Training Observatory, which makes use of statistics from the Ministry of Education and Vocational Education and Training (EDUCAbase). We also make use of the contraction rates (e.g. retirements, etc.) calculated by CEDEFOP available by occupation.

- The additional workforce required is calculated by subtracting the forecast workforce based on expansion and contraction rates from the workforce required to achieve ERESEE targets and considering job creation since the entry into force of ERESEE.

YEAR	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	ACUMULADO
Rehabilitated dwellings	30	35	40	45	50	100	150	200	250	300	1,200
New dwellings built	99	106	113	121	130	139	149	159	170	182	1,367
Total	**129**	**141**	**153**	**166**	**180**	**239**	**299**	**359**	**420**	**482**	**2,568**

Table 78. Rehabilitation and new dwelling construction targets set in ERESEE, thousands. Source: ERESEE.

The table shows an expected steady increase in new construction to almost double the production rate. This contrasts with the increase in rehabilitation needs, which will have to increase tenfold between 2021 and 2030. To achieve these milestones, it is important to consider the current levels of new construction and rehabilitation. In the last eight years, the number of dwellings built has doubled, while the number of rehabilitations has remained the same.

YEAR	2015	2016	2017	2018	2019	2020	2021	2022
New dwellings completed	45,152	40,119	54,610	64,354	78,789	85,945	91,390	89,107
Compared to 2015	100%	89%	121%	143%	174%	190%	202%	197%
Rehabilitations completed	25,413	26,094	26,024	26,017	28,533	25,294	27,189	24,102
Compared to 2015	100%	103%	102%	102%	112%	100%	107%	95%

Table 79. Number of rehabilitations and new dwelling construction 2015-2022, thousands. Source: MITMA

Using this available information, a forecast can be generated according to the marked trend, and making use of lower and upper confidence intervals, to provide a potential range of construction rates for each

sub-sector. The forecast has been made by simple linear regression, without using other explanatory variables, and using eight observations.

The following forecast of the number of new dwellings built per year has been made with a confidence level of 95% and a standard deviation of 20,421. The data are presented in the annex.

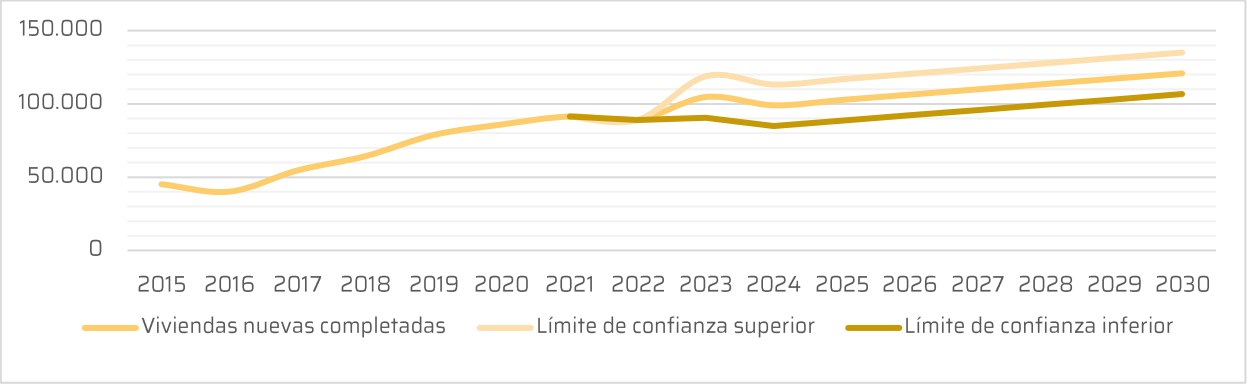


Chart 38. Forecast of new dwelling construction per year, 2023-2030. Source: own elaboration with MITMA data

The forecast of new dwelling compared to the scenario outlined by ERESEE between the years 2021 and 2030 are shown below. These show that ERESEE target is 29.6% higher than the forecast level of construction.

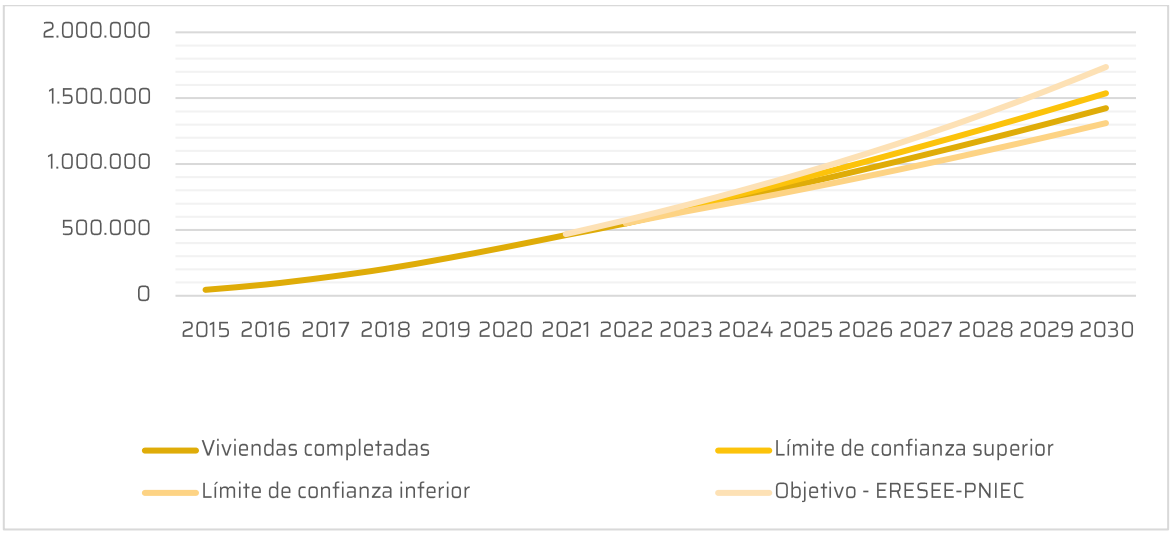


Chart 39. Cumulative forecast of new dwelling construction and ERESEE target by year, 2023-2030. Source: Prepared by the authors with data from MITMA and ERESEE.

The following forecast of the level of completed rehabilitations per year is presented considering a confidence level of 95 % and a standard deviation of 1.322.

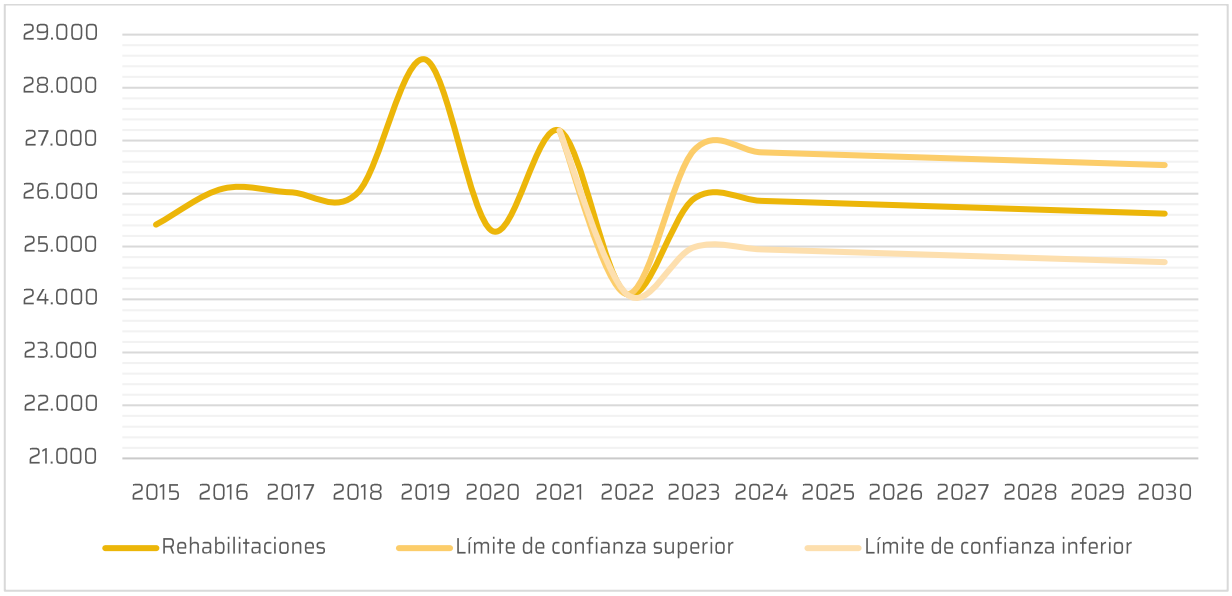


Chart 40. Forecast of dwelling rehabilitations completed per year, 2022-2030. Source: Prepared by the authors with MITMA data

The forecast of rehabilitated dwellings compared to the scenario outlined by ERESEE between the years 2021 and 2030 is shown below. These show that ERESEE target is 366 % higher than the projected level of construction.

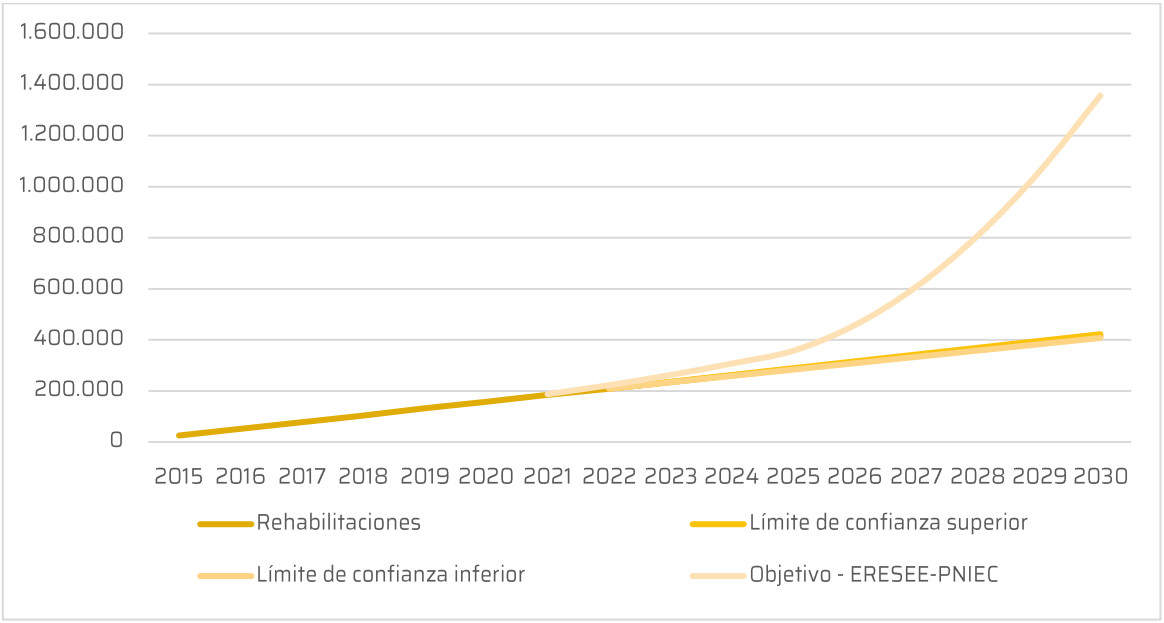


Chart 41. Cumulative forecast of rehabilitated dwellings and ERESEE target per year. Source: Prepared by the authors with MITMA data.

ERESEE Scenario - Global Forecast for the Construction Sector

With the information and forecasts for the sub-sectors above, we create a joint forecast of progress towards the national targets contained in ERESEE. The percentage difference between the forecast quantity and the targets are mentioned next to each illustration.

	REHABILITATION	% DIFF	NEW DWELLINGS	% DIFF	TOTAL COMPLETED	%
ERESEE-PNIEC cumulative target (2021-2030)	1,200,000	100%	1,367,040	100%	2,567,040	100%
Construction levels (2020-2022)	76,585	6%	266,442	19%	343,027	13%
Cumulative forecast (2021-2030)	257,385	21%	1,054,976	77%	1,312,361	51%
Lower cumulative forecast (2021 - 2030)	250,057	21%	941,767	69%	1,191,824	46%
Upper cumulative forecast (2021 - 2030)	264,712	22%	1,168,184	85%	1,432,896	56%

Table 80. General description of forecast constructions. Source: Prepared by the authors with data from MITMA and ERESEE.

The number of construction workers in 2020, the year before the start of ERESEE, is 1,244,077. Excluding the number of workers in civil engineering, this leaves 1,137,029 workers. We approximate the number of workers needed to achieve the targets using a rule of proportions:

> **Workforce required in the year 2030: Workforce (2021) / Difference from conservative cumulative forecast: 1.185.289 / 56% = 2.123.451.**

This rule of proportions implies that at the start of ERESEE, construction activity accounted for 56% of the activity needed to achieve the objectives set out in ERESEE. This means that between 2020 and 2030 there is a need to recruit 899,964 workers. Considering that by the end of 2023 - and two years since the start of ERESEE - a total of 1,242,509 workers are already working in the construction sector, this would mean that 105,479 workers have already joined the sector. Therefore, between 2024 and 2030, 794,485 additional workers will be needed. Additional recruitment needs should consider the number of workers who are due to retire and those in training.

Forecast of the workforce in the construction sector

We calculated what in 2030 the workforce would be in a scenario without increases in economic activity by considering the number of workers who will retire in the coming years as well as the number of students expected to enter the labour market. This is particularly relevant in this context because of the lack of generational change in construction.

Workforce training for the construction sector is dependent on the VET system as well as the university training system for construction occupations. In academic year 2021-2022, there was a slight upturn in the number of enrolments in Vocational Education and Training in the construction vocational family, reaching 6,256 enrolments. This is the year with the highest number of enrolments since academic year 2014-2015 and at the same time 19% less than the number of enrolments in academic year 2012-2013, 7,723 students. The number of qualifications obtained in Vocational Education and Training in Construction has evolved in proportion to the number of graduates, with a significant increase in the percentage of qualification in the year 2020-2021, reaching 1,678 graduates.

	2012-2013	2013-2014	2014-2015	2015-2016	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022
Students enrolled	7,723	7,099	6,627	5,960	5,663	5,282	5,210	5,469	6,130	6,256
Difference compared to the level of enrolment in 2012-2013	0%	-8%	-14%	-23%	-27%	-32%	-33%	-29%	-21%	-19%
Qualifications	2,275	2,000	1,813	1,672	1,510	1,331	1,285	1,273	1,678	ND
Difference compared to the level of qualifications in 2012-2013	0%	-12%	-20%	-27%	-34%	-41%	-44%	-44%	-26%	-

Table 81. Enrolled students and VET graduates in the occupational family of Construction. Source: Prepared by the authors using data from the observatory of Vocational Education and Training based on data from MEFP-EDUCABASE.

The trend in the number of graduates in university education has been decreasing in recent years, by 49 % between 2015 and 2020 as well as a 39.9 % decrease in the number of enrolments. Thus, the study Young university students and employability. Qualifications, booming professions and labour transition forecasts that there will be slightly more than 5,000 graduates/qualifications per year in the coming years.

FIELD OF STUDY	GRADUATES, 2015-2020	ENROLLED, 2015-2021	ENROLLED 18-21-YEAR-OLDS, 2012-2021	FORECAST GRADUATES PER YEAR
Architecture and Construction	-49.0%	-39.9%	-11.0%	5,483
Total	2.5%	1.4%	13.2%	204,492

Table 82. Evolution of the number of graduates and enrolments of 18-21-year-olds by field of study. Source: Young university students and employability. Qualifications, booking professions and labour transition, by Randstad Research and the San Pablo CEU University Foundation.

The data forecasts that the vast majority (92%) of graduates in the field of Engineering, Industry and Construction will be employed within 5 years of graduation.

	EMPLOYED	UNEMPLOYED	INACTIVE	TOTAL
Engineering, Industry and Construction	92%	4.60%	3.40%	100%
Total university graduates	86.10%	7.50%	6.40%	100%

Table 83 . Employability rate of university graduates. Source: Labour market insertion survey of university graduates 2019. INE

Graduates may or may not work in the construction sector. The data should therefore be taken as indicative. It is important to note that concentration in one sector of activity or dispersion across several sectors is neither positive nor negative. However, it is interesting to know in which sectors there are job opportunities for graduates of a given qualification. For example, 19.4% of graduates in naval and oceanic engineering work in the construction and civil engineering sector. On the other hand, 19.6% of materials and civil engineering graduates end up working in the manufacturing industry.

For the purpose of calculating training needs, we assume that employees at management level and in the professional categories and associated professionals have a high level of qualifications, i.e. EQF 6 to 8. Those employed in trades have an average level of qualification, i.e. EQF 3-4. Those employed in the operational and elementary level category are assumed to have low skill levels.

Assuming that all VET students in the occupational family of construction and 92% of university graduates in architecture and construction are integrated into the sector, and that these remain constant in the coming years, this would mean an increase of 82,173 working people between 2024 and 2030 from vocational and university training.

	2021-2022[7]	2024-2030
Workers coming from Vocational Education and Training	6,256	43,792
Workers coming from Universities	5,483	38,381
Total	**11,739**	**82,173**

Table 84. Forecast of new workers in the construction sector. Source: Prepared by the authors.

Apart from the workforce that will be added in the coming years, the next step is to consider the workforce that will leave the sector, as this will generate additional recruitment needs. The following table makes use of the replacement rates in each occupation published by CEDEFOP. These have been applied to the construction sector.

[7] Último año para el que hay datos.

OCCUPATION	NUMBER OF WORKERS IN BUILDING AND SPECIALISED WORK (2021)	TOTAL FORECAST WORKFORCE IN 2030	DECREASE IN WORKFORCE	ANNUAL REPLACEMENT RATE
Structural construction workers and related workers	394.122	315.597	109.806	4,0%
Construction and installation finishers (except electricians), painters and related workers	201,826	161,614	51,306	3.6%
Electrical and electrotechnical workers	141,099	112,986	41,829	4.3%
Construction and mining workers	81,843	65,536	28,903	5.3%
Professionals in the physical, chemical, mathematical and engineering sciences	46,346	37,112	13,190	4.1%
Production and operations managers	37,981	30,414	11,482	4.4%
Locomotive drivers, operators of agricultural machinery and mobile heavy equipment, and seamen	34,831	27,892	11,917	5.1%
Supervisors in mining engineering, manufacturing and construction industries	33,364	26,717	7,855	3.3%
Other administrative staff without front-office duties	31,336	25,093	7,966	3.6%
Welders, sheet metal workers, structural steelworkers, blacksmiths, toolmakers and related trades	27,281	21,845	8,406	4.5%
Science and engineering technicians	24,879	19,922	-	0.0%
Clerical workers with front-office duties not classified elsewhere	20,773	16,634	5,662	3.9%
Employed in accounting, financial, production support services and transport services	14,980	11,995	5,692	5.8%
Sales representatives, sales agents and related	12,200	9,769	3,688	4.4%
Drivers of vehicles for urban or road transport	10,551	8,449	2,551	3.4%
Heads of administrative and commercial departments	9,914	7,939	2,881	4.2%
Directors and managers of other service companies not classified elsewhere	9,616	7,700	2,794	4.2%
Administrative management support professionals; law enforcement technicians	8,316	6,659	2,010	3.4%
Assemblers and mounters in factories	7,567	6,060	1,970	3.7%

OCCUPATION	NUMBER OF WORKERS IN BUILDING AND SPECIALISED WORK (2021)	TOTAL FORECAST WORKFORCE IN 2030	DECREASE IN WORKFORCE	ANNUAL REPLACEMENT RATE
Other	36,465	29,199	10,159	4.0%
Total	**1,185,289**	**949,133**	**330,069**	

Table 85. Forecast of workforce leaving the construction sector. Source: Prepared by the authors with data of EPA (INE) and CEDEFOP Skills Forecast. Note: The most relevant occupations are shown in green and those of medium relevance for energy performance are shown in yellow.

By 2030, therefore, a total of 82,173 people is expected to enter the sector, and 330,069 people are expected to leave it, implying that by 2030, the forecast workforce would be 949,133 people.

$$L_{\text{proyected } 2030} = L_{2021} + E_{Students} - T_{Retired} = 1.185.289 + 82.173 - 330.069 = 949.133$$

Where $L_{\text{proyected } 2030}$ is the total labour projected for 2030, L_{2021} is the labour force in 2021, $E_{Students}$ is the employed students, and $T_{Retired}$ are the retired workers 2030.

The following table shows the occupational breakdown of workers, assuming that the occupational distribution remains the same and considering the workforce already created between 2021 and 2023.

OCCUPATION	WORKERS IN BUILDING AND SPECIALISED CONSTRUCTION (2021)	WORKERS IN BUILDING AND SPECIALISED CONSTRUCTION (2023)	TOTAL WORKFORCE REQUIRED TO ACHIEVE THE 2030 GOALS	TOTAL WORKFORCE FORECAST 2030	ADDITIONAL WORKFORCE REQUIRED 2030	OCCUPATIONAL DISTRIBUTION %
Structural construction workers and related workers	394,122	407,035	706,071	315,597	390,474	33.3%
Construction and installation finishers (except electricians), painters and related workers	201,826	221,153	361,572	161,614	199,958	17.0%
Electrical and electrotechnical workers	141,099	159,354	252,779	112,986	139,793	11.9%
Construction and mining workers	81,843	102,024	146,621	65,536	81,085	6.9%
Professionals in the physical, chemical, mathematical and engineering sciences	46,346	46,038	83,029	37,112	45,917	3.9%
Supervisors in mining engineering, manufacturing and construction industries	37,981	31,089	68,043	30,414	37,629	3.2%

OCCUPATION	WORKERS IN BUILDING AND SPECIALISED CONSTRUCTION (2021)	WORKERS IN BUILDING AND SPECIALISED CONSTRUCTION (2023)	TOTAL WORKFORCE REQUIRED TO ACHIEVE THE 2030 GOALS	TOTAL WORKFORCE FORECAST 2030	ADDITIONAL WORKFORCE REQUIRED 2030	OCCUPATIONAL DISTRIBUTION %
Locomotive drivers, operators of agricultural machinery and mobile heavy equipment, and seamen	34,831	28,011	62,401	27,892	34,509	2.9%
Production and operations managers	33,364	37,293	59,772	26,717	33,055	2.8%
Welders, sheet metal workers, structural steelworkers, blacksmiths, toolmakers and related trades	31,336	21,267	56,139	25,093	31,046	2.6%
Other administrative staff without front-office duties	27,281	22,663	48,874	21,845	27,028	2.3%
Clerical workers with front-office duties not classified elsewhere	24,879	23,630	44,570	19,922	24,648	2.1%
Employed in accounting, financial, production support services and transport services	20,773	23,009	37,215	16,634	20,581	1.8%
Science and engineering technicians	14,980	20,090	26,836	11,995	14,841	1.3%
Drivers of vehicles for urban or road transport	12,200	8,843	21,857	9,769	12,087	1.0%
Sales representatives, sales agents and related	10,551	16,312	18,902	8,449	10,453	0.9%
Heads of administrative and commercial departments	9,914	7,183	17,762	7,939	9,823	0.8%
Directors and managers of other service companies not classified elsewhere	9,616	10,592	17,228	7,700	9,527	0.8%
Administrative management support professionals; law enforcement technicians	8,316	10,193	14,898	6,659	8,239	0.7%
Assemblers and mounters in factories	7,567	7,971	13,557	6,060	7,497	0.6%
Other	36,465	38,759	65,326	29,199	36,127	3.1%
Total	**1,185,289**	**1,242,509**	**2,123,451**	**949,133**	**1,174,318**	**100.0%**

Table 86. Forecast of the workforce required per occupation to achieve the 2030 Goals. Source: Prepared by the authors..

The results show that considering training and retirement rates, this means that 1,174,318 additional workers would be needed until 2030. This means that there would be 2,123,451 people working in the sector in 2030. Considering job creation between 2021 and 2024, this implies that from 2024 until the end of ERESEE, 1,117,098 people would need to be hired.

$$M_{additional\ 2030} = M_{required\ 2030} - M_{projected\ 2030} - E_{(2021-2023)}$$
$$= 2{,}123{,}451 - 949{,}133 - (1{,}242{,}509 - 1{,}185{,}289) = 1{,}117{,}098$$

Where $M_{additional\ 2030}$ represents the additional labour needed in 2030, $M_{required\ 2030}$ is the total labour required to achieve the 2030 goals, $M_{projected\ 2030}$ is the total labour projected for 2030, and $E_{(2021-2023)}$ refers to the jobs created between 2021 and 2023.

By differentiating between the most relevant occupations, those of medium relevance and those of low relevance, a better picture of workforce needs is obtained. Thus, 436,719 workers are needed in occupations that are highly relevant to energy efficiency. Recruitment needs in these occupations are particularly important, as they are in many cases occupations with changing skill demands and closely related to energy efficiency. In a second tier, a total of 423,369 workers are needed in occupations of medium relevance and 257,010 workers would be needed in occupations not or not directly related to energy efficiency.

	ISCO CODE - TWO DIGITS	ADDITIONAL WORKERS NEEDED
High Relevance	72, 75, 96, 32, 83	436,719
Medium Relevance	71, 73, 84	423,369
Low Relevance		257,010
Total		**1,117,098**

Table 87. Additional workforce required by occupation relevance for energy performance. Source: Prepared by the authors.

Alternative scenarios - Global forecast for the construction sector

In order to look at the effects of energy rehabilitation on employment, we recalculated workforce requirements using three alternative scenarios. For this we assume that the pace of new construction follows the current rate of construction, with 900,000, 700,000 and 500,000 dwellings rehabilitated between 2021 and 2030 respectively, instead of the 1,200,000 targeted by ERESEE. Using the same forecast workforce metrics, including number of workers entering the sector and those leaving, we calculate the employment needs for the three alternative scenarios:

	Total workforce required	Additional workforce required
Scenario 1 - 900,000 rehabilitations, 1,168,184 new dwellings	1,710,798	761,665
Scenario 2 - 700.000 rehabilitations, 1,168,184 new dwellings	1,545,358	596,226

Scenario 3 - 500,000 rehabilitations, 1,168,184 new dwellings	1,379,919	430,786

Table 88. Forecast of additional workforce required in three alternative scenarios. Source: Prepared by the authors with data from MITMA and ERESEE.

Thus, in the first scenario, which includes 900,000 rehabilitations, 761,665 additional workers would be needed. Similarly, the rehabilitation of 700,000 dwellings implies the need to hire 596,226 people. Finally, an even more conservative scenario, in which 500,000 rehabilitations are conducted, implies the need to hire 430,786 people.

To complete the analysis, we conducted a sensitivity analysis in order to assess how changes in the number of rehabilitations affect the additional workforce requirements. Sensitivity analysis provides valuable information on the robustness and vulnerability of the model. We changed only one parameter at a time, keeping all other parameters constant in a univariate analysis. The results show the direct relationship between the number of rehabilitations and the additional workforce required.

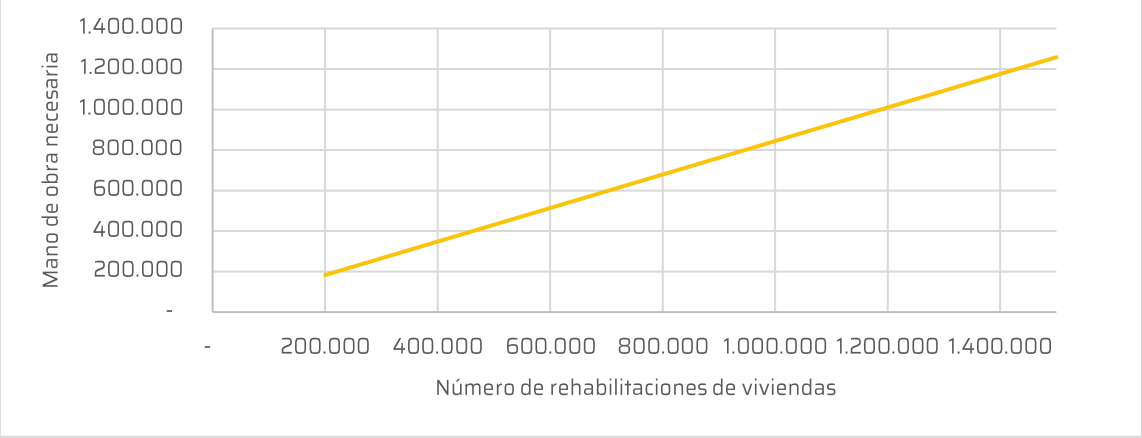


Chart 42. Sensitivity analysis of the need for additional workforce. Source: Prepared by the authors.

7.3. Need for qualification

It seems clear that training is necessary to generate energy efficiency skills at all levels.

Given that building production processes cover a wide variety of stages involving a large number of people with different occupational profiles, experts consider that **generic basic contents** to be taught to all workers should be established. It must be a cross-cutting transformation; the change of model seems to need to be embraced at all levels. More technical, and perhaps higher education profiles need to have the technical skills to ensure rehabilitations that transform energy efficient buildings, or design and project manage new nearly zero-energy buildings. However, it is imperative that professional installers and other operators are also prepared to conduct the work with a view to achieving the best possible energy performance of the building or dwelling.

Those involved in the qualitative study also agree that it is necessary to have clear priorities, and the initial phase is to **reduce the energy needs of the building**. Secondly, we must work on the contribution of renewable energy.

Continuing training is particularly important in the building rehabilitation activity, as it is in the midst of a paradigm shift that requires continuously updating the skills of workers. In this respect, the importance of training centres having staff to provide guidance between professionals and the existing training offer is emphasised.

7.3.1. Characteristics of existing training

In general, some **imbalance** seems to be perceived in the **training offering,** both at university level and at vocational education and training level, and both in that addressed to the construction sector in general and that addressed to energy efficiency and the use of renewable energies in particular.

The following barriers, common to both the vocational and university systems, are highlighted:

1. Need to practice the knowledge learnt in a construction site environment.

2. Difficulty for the formal education system to design training and respond quickly to operational and technological developments in the construction sector.

3. Need for teachers to update their skills on specific requirements.

While in Chapter 5, the experts assessed the integration of certain skills into the Vocational Education and Training and university system, they also assessed whether the National Catalogue of Vocational Qualifications and continuing education was providing skills in energy efficiency and renewable energy use at all stages of construction.

The following table shows the ratings obtained for each work phase, adding, in addition, the assessment of the importance of the work phase for the energy performance of the building.

WORK PHASE	IMPORTANCE FOR THE EE AND RES	LEVEL OF INTEGRATION OF EE AND RES IN NCPQ IN TRAINING		LEVEL OF INTEGRATION OF EE AND RES IN CONTINUING EDUCATION	
	AVERAGE	AVERAGE	MODE	AVERAGE	MODE
1. Urban planning and building projects	4.74	4.44	5.00	3.63	4.00
2. Control and monitoring of the execution of works	4.63	3.50	4.00	3.69	4.00
3. Thermal insulation, acoustic insulation and waterproofing of buildings	4.47	3.27	4.00	3.65	4.00

WORK PHASE	IMPORTANCE FOR THE EE AND RES	LEVEL OF INTEGRATION OF EE AND RES IN NCPQ IN TRAINING		LEVEL OF INTEGRATION OF EE AND RES IN CONTINUING EDUCATION	
	AVERAGE	AVERAGE	MODE	AVERAGE	MODE
4. Exterior carpentry and solar protection	4.32	3.14	3.00	3.60	4.00
5. Sealing of joints and seals	4.12	2.64	3.00	3.60	4.00
6. Renewable energy production facilities	3.89	3.75	3.00	3.40	4.00
7. Cooling, heating and hot water installations	4.11	3.94	5.00	2.75	3.00
8. Electrical and lighting installations in buildings and urban areas	3.63	3.94	5.00	2.50	2.00
9. Parks, gardens, waterworks and urban drains	3.34	3.13	3.00	3.09	4.00
10. Maintenance of buildings and urban facilities	3.98	2.94	2.00	2.55	3.00
11. Selective demolitions	3.23	1.79	1.00	2.29	1.00
12. Waste management on construction sites	3.85	2.00	2.00	1.55	1.00

Table 89. Level of integration of energy efficiency and renewable energy training in the national catalogue of professional qualifications and in further training, by work phase (accompanied by its relevance for reaching the 2030 Climate Goals).

Regarding the **training referenced to the National Catalogue of Professional Qualifications** (levels 3-5 EQF), the experts consider that there is training at appropriate levels related to energy efficiency and the use of renewable energy in the phases of urban planning and building projects, with ratings above 4 on the established scale. At the next level, with ratings between 3 and 4, i.e. with a more moderate level of training, are positioned most of the aspects, such as Cooling, heating and hot water installations, Electrical and lighting installations in buildings and urban areas, Renewable energy production installations, Control and monitoring of the execution of works, Thermal and acoustic insulation and waterproofing of buildings, Exterior carpentry and solar protections, and Parks, gardens, waterworks and urban drainage.

The experts consulted consider that there are certain training needs in some phases within the construction process, in particular, Maintenance of buildings and urban facilities, Sealing of joints and joints and Waste management on construction sites (with ratings between 2 and 3). But, above all, they consider that the selective demolitions phase is the most deficient (with ratings between 1 and 2).

On the other hand, analysing to what extent there is **continuing training** for workers related to the efficiency and use of renewable energy, the experts consider that there is training to a moderate level in most phases, with ratings between 3 and 4. It includes those related to cooling, heating and hot water installations, renewable energy production installations, urban planning and building projects, control and monitoring of the execution of works, electrical and lighting installations in buildings and urban areas,

thermal and acoustic insulation and waterproofing of buildings, and exterior carpentry and solar protection.

Below this rating (3), the rest of the phases are positioned with levels of training that can be improved: Maintenance of buildings and urban facilities, Parks, gardens, waterworks and urban drainage, Sealing of junctions and joints and Waste management on construction sites, and much more critically, Selective demolitions (below 2).

By way of conclusion, analysing the data in the table above, the following can be said:

- The selective **Demolitions and waste management phases** have the least training in energy efficiency and the use of renewable energy, both by the NCPQ and by continuous training.

- The phase of **Urban planning and building projects**, the most relevant phase to achieve the 2030 Climate Goals, seems to receive an appropriate training offer both by the NCPQ and by continuing training.

- However, the phases **Cooling, heating and hot water installations, Electrical and lighting installations in buildings and urban areas**; it seems that they receive training in energy efficiency and renewable energy to a higher level by the NCPQ than by continuing training.

- The phase of **Parks, gardens, waterworks and urban drainage** has the lowest average integration of skills. This is also reflected in the need for training of green roof and green façade specialists.

However, experts comment that, despite the improvements needed in the various education and training systems, there is a **scarce demand for training**, both by young people and by workers and companies.

In relation to this fact, the publication **Recommendations of the working groups for the implementation of ERESEE 2020** (2023) establishes a line of action aimed at addressing the low number of people interested in training in the sector relating to energy efficiency and the use of renewable energy, and proposes to precisely include "building rehabilitation" as a strategic sector in the training demand and training supply calls launched by the SEPE and the Ministry of Education and Vocational Education and Training. In addition, it is recommended that the manufacturers of materials for the different specialities be involved in the development of these training courses.

Differences between training at VET levels and University, Master's and other levels

In general, however, the experts consider that there is a need for further adjustment of the training related to energy efficiency and renewable energy use offered in the education systems, although it does seem to be somewhat more positively rated at university and Master's levels than at VET levels.

With regard to EQF levels 6, 7 and 8, i.e. the skills that in the education system are found in university degrees and master's degrees, the contents referring to energy efficiency and renewable energy should have a more cross-cutting nature than at present. In order to specialise in the subject, it is necessary to take a Master's degree, as the Bachelor's degree alone is more generic in nature.

In general, there is a perception that EQF levels 3, 4 and 5 (corresponding to basic, intermediate and higher VET in the education system) are correctly trained in EE and RES, while levels 1 and 2 are not provided with such training. In this sense, there seems to be a more consolidated structure in terms of attracting talent for level 3 and 4 profiles, but not for level 1 and 2 profiles.

Experts consider that a more practical rather than theoretical approach is needed at VET levels. This approach is provided by dual vocational training, a model that has been institutionally promoted for a few years now, and which, for its success, requires real involvement and links between the training centre, the company where the practical knowledge is acquired, and the students.

It seems necessary to further strengthen vocational training with agreements and public-private partnerships that are flexible and adjusted to the needs of students and companies.

Another aspect that has been mentioned is that the largest mismatches in training according to gender are found in levels 1 and 2, with these mismatches disappearing in level 3 and 4 profiles.

According to the experts' opinion, in general, non-NCPQ, EE and EERR provision tends to be on-demand (i.e. it is the company that requests a certain training for workers), of short duration, shallow and poorly regulated. Ideally, we would like to have a longer-term offer, with more planning.

There is a certain lack of standardisation in the accreditation of training not referenced to the NCPQ: there are courses of different levels, different audiences, etc., without a clear homogenisation of level. Perception that there is no clear link between the people who have been trained by means of a training offer not referenced to the NCPQ, and the companies that demand these profiles.

There seems to be a need for a link between private training (mainly offered by companies), public training, in order to unify content and benefit from the synergies of both training schemes, and the workers themselves.

7.3.2. Training centres

In the case of higher education, degrees in architecture, technical architecture, engineering and technical engineering can be obtained in all the country's autonomous communities. Although there is a downward trend in the number of students in the field of architecture and engineering studies, if the number of graduates in the last 5 years is considered.

Bachelor's degrees are generalist, and specialisation in energy efficiency and renewable energy, as well as subjects related to sustainable construction, can be found in the various master's degrees created by the universities themselves.

With regard to vocational training, the network of vocational training centres is diversified. This network is composed of specific Professional Training Centres and by Centres that are renowned nationally**.** There are **few centres** providing training on EE and RES in buildings. There seems to be a certain relationship between the low demand of students compromising the budgets of the administration for these centres and courses, which leads to a reduction of resources for more centres or for improving facilities; all this determines that potential students do not have a variety of training centres to choose from. VET centres have been growing according to the demand of each territory and not so much according to sectoral needs.

7.3.3. Trainers

In general, there seems to be a certain regulatory rigidity for teaching staff, which is acting as a clear barrier to training. It is considered that the regulations governing access to the teaching profession are very rigid and it is pointed out that, pursuant to the current regulations, it is necessary for training to be conducted by professionals with certain qualifications, regardless of whether or not they have real experience in the sector. However, it seems clear that it would be more appropriate to have both skills available

Furthermore, it is considered complicated to combine knowledge of the sector with a teaching and pedagogical knowledge base, so the ideal person to act as a trainer is considered to be a person who dedicates part of his/her working day to training but who maintains his/her own professional work in the construction and related sectors (similar to the role of the **Associate Professor** in universities).

It is therefore necessary to **define the qualifications** that **trainers** in EE and RES in buildings will need.

7.4. Monitoring needs

In relation to the instruments for tracking or monitoring skills and training requirements, there are different occupational and professional observatories:

RELEVANT OBSERVATORIES	
Skills Observatory for the construction sector.	Construction Blueprint
Professional Observatory	INCUAL (Ministry of Education and Vocational Education and Training)
Occupations Observatory	SEPE (Ministry of Labour)
Industry Observatory of Construction	Fundación Laboral de la Construcción (Social Agents)

Observatory of Vocational Education and Training	Caixabank (financial institution)
Observatory 2030	Consejo Superior de los Colegios de Arquitectos de España (Higher Council of the Spanish Architects' Associations)
Observatory for nature-based solutions	CONAMA Foundation and IUCN Centre for Mediterranean Cooperation

Table 90. Relevant observatories related to the monitoring of training needs and skills requirements. Source: Prepared by the authors.

Both the Ministry of Education and Vocational Education and Training and the Ministry of Universities, as well as FUNDAE, conduct control and monitoring of the qualifications and courses offered in the vocational, university and continuous training system.

The Observatories indicated above are active, publishing regular reports on the situation of the sector, the labour market, trends in employment and in construction activities, etc. However, the day-to-day reality means that developments in the sector are faster than the response capacity of the training systems, the most agile being the university system and the so-called "demand training" of training aimed at workers.

Finally, in the last update of the 'Long-term Strategy for the energy rehabilitation in the building sector in Spain' (ERESEE) in 2020, promoted by the Ministry of Housing and Urban Affairs and coordinated by the Green Building Council in Spain, the need to perfect the methodology and results of the "Observatory of Occupations of the Public State Employment Service (SEPE)" is recorded, supporting the identification of training needs by agents of the sector, associations of installers and manufacturers, universities, technological institutes and collective bargaining negotiations.

Other lines of action related with training and corporate teaching in the sector were revised by more than 80 experts who participated in this process, which included social entities that are partners of Construye 2030.

In addition to the above-mentioned line of action, other measures related to training in the construction sector were proposed. The importance of including them in the Status Quo lies in the fact that these lines of action will be considered for inclusion in the next National Building Rehabilitation Plan, so they can be monitored.

ERESEE MEASURE ASSESSED Improvement of the initial and continuous academic training of technicians
Updated lines of action
Having different formats (master's degrees, specialisation courses, refresher courses) in order to reach a larger number of professionals.
Clarifying at all times the objectives and criteria of the ecological and digital transition driving the transformation of the stock (decarbonisation, circular economy, digitalisation, etc.).

Including both technical-scientific issues related to the construction and installation of buildings, as well as management, administrative, financing, marketing and social dialogue to work with neighbourhood communities.
Orientation towards the use of new digital tools, both technical and for collaboration between agents, such as Building Information Modelling (BIM), Geographic Information System (GIS), etc.
Adaptation of undergraduate curricula by universities towards rehabilitation.
Promoting forecasting and detecting continuous training needs.
ERESEE MEASURE ASSESSED Initial and continuing VET for workers in the construction and rehabilitation sub-sector, e.g. new VET, Massive Online Open Courses (MOOCs), etc.
Updated lines of action
Incorporating "Building Rehabilitation" in demand and supply side training.
Enabling dual vocational training and continuing education.
Introducing quality criteria in aid, procurement and public contracting.
Promoting vocational training in energy rehabilitation.
Relaxing initial training requirements for in-service teachers.
Promoting a labour market that empowers certified workers.

Table 91. Recommendations of the working groups for implementing ERESEE 2020 measures. Source: Prepared by the authors based on data obtained from the Long-term strategy for energy rehabilitation in the building sector in Spain.

8. Barriers

After analysing the discourse of the experts participating in the dynamic, the following types of barriers can be identified:

8.1. Resource barriers

Limited access to training through public and private resources

There are currently few students accessing training and qualification in energy efficiency through public and private resources. This is largely due to a lack of awareness due to the poor dissemination of the training that is offered, but also to the lack of attractiveness of the sector, especially for young people. Public funding is a clear support for the organisation of training in the sector, although it is not always sufficient. It is desirable to have special calls specifically aimed at the sector and financed to cover the training and qualification needs in these areas.

8.2. Administrative barriers

Experts consider that existing training is distorted or affected by the following elements related to administrative tasks:

Anticipation of market needs

With regard to training provision, the experts agree that there is sometimes a lack of alignment between the qualifications offered and the jobs that meet the needs of companies.

Its updating contrasts with the increasingly rapid changes in the field of energy efficiency and renewable energy. Although vocational training qualifications currently include energy efficiency content, it is essential to update the associated training to include other aspects of energy efficiency and sustainability, and it is also necessary to work on the vocation of the youngest members of the public. One possibility would be to create basic-level VET within the energy and water family, as it does not currently exist.

Professional recognition in certain positions

As new occupational profiles emerge, new skills will need to be acquired. These may be linked to the requirements of current regulations, but also to the expansion of a particular construction system. As new models of construction and skills develop, public-private collaboration becomes essential to adjust the training offer to the needs of both companies and workers.

Channelling of funding and delivery of training

Funding is important for the qualification of professionals. To this end, it is essential to develop public-private financing models adapted to the needs of both companies and workers. In addition, more flexibility is required in the timetable for training, in the minimum number of participants and in the modes of delivery in order to ensure the continuity of the training cycles.

Difficulties in implementing Dual VET

Experts agree that the inclusion of apprentices on site through dual VET is positive. However, there are difficulties in adapting regulatory requirements in an atomised sector, with a majority of small and very small enterprises, among other factors. This is why there is a need for dialogue between all the agents involved in the sector, so that everyone can move towards the changes that the 2030 Goals entail.

Regulatory rigidity for trainers

Experts consider that the regulations governing access to the teaching profession are too rigid. They point out that, pursuant to current regulations, training must be conducted by professionals with certain university degrees, regardless of experience in the sector. Although it seems clear that the most appropriate would be to meet both requirements to provide training.

This regulatory rigidity is causing the loss of a chain of knowledge that is difficult to recover.

In addition, they consider that it is complex to combine knowledge of the sector with a teaching and educational knowledge base, which is why the ideal trainer is considered to be a person who devotes part of their working day to training, but who maintains their own professional work in the construction and related sectors (similar to associate lecturers in Universities).

8.3. Structural barriers in the sector

Low attractiveness to women and young people

The construction sector is perceived as unattractive in large parts of society and the task of making it visible is very complex. An increasing number of new entrants to the sector do not have a vocation for specific occupations. This is partly due to the prevailing perception that the construction professions are not recognised, but also because of the stigmatisation of the sector during the last two crises. The gender roles applied to certain construction occupations remain a barrier to both attracting more women workers and promoting them within the company ranks.

Digitalisation and the use of new technologies brought about by new trends, such as industrialisation, can help to make the sector more attractive, especially for younger groups.

There is a need to send a message that the construction and allied sectors are working in safe, healthy environments, with attractive shifts and pay, and that work is increasingly being implemented in well-conditioned environments, interacting with technology.

Business atomisation

For SMEs in the construction and related sectors, the training and qualification of workers involves a greater organisational and administrative effort than for a large company, where greater organisational resources are available and activity is not interrupted. In SMEs the number of workers to be trained is smaller and therefore economies of scale are not available. Despite this, SMEs have business associations, advisory and consultancy firms that do the work of keeping companies up to date in terms of necessary training.

Differences in the training of workers

There are big differences in terms of skills to achieve the 2030 Goals for different groups depending on their qualifications and occupations within the sector. Highly qualified technical staff need to acquire and develop more skills related to the application of energy efficiency and renewable energy, although they have greater possibilities and a greater capacity for adaptation compared to operators.

As an example, and in general terms, professional architects with a lot of experience in the sector have the necessary skills because they have trained themselves.

High turnover and lack of generational replacement

There is an alarming workforce shortage in the construction sector, particularly in the comprehensive rehabilitation segment. There is a higher turnover among senior and middle management due to the shortage and lack of generational replacement, which makes it difficult to plan the training of workers.

8.4. Educational/cultural barriers

Lack of vocational guidance networks

Vocational (academic and professional) guidance plays a key role for education systems to achieve their goal of preparing students for the adult world. In addition to a lack of awareness of the training and courses available in the sector, career guidance networks do not always consider construction as an option.

On the one hand, there is the Mode effect, or Mode process, whereby young people choose educational pathways without being fully convinced, which has an impact on graduation rates.

On the other hand, students are looking for training offers in which they acquire transversal skills that enable them to work in different occupations and sectors. Vocational guidance is being improved through the network system.

More training offers are being created according to the needs of the sector. For this reason, guidance plays an essential role, in addition to providing basic knowledge about a job (salary, collective agreement, etc.), what is in demand, how it evolves and the information necessary to access it. Even so, vocational guidance requires further efforts and development.

Adaptation to the needs of foreigners

Construction functions as a host sector for unskilled and inexperienced migrants. During their training there are cultural and language barriers that hinder the acquisition of minimum qualifications. Attracting more migrants therefore requires training materials and models adapted to them.

Training delivery models

Training delivery models require a large amount of subject matter to be covered, which can become too theoretical. Therefore, trainers with both pedagogical and professional experience are required. However, it is difficult to recruit professionals to train students in periods of growth such as the current one, as the education sector cannot compete with construction wages. Energy efficiency trainers, on the other hand,

have employment contracts limited to the duration of the specific training course and work in multiple training centres, which limits their further training.

Mismatch between training and market needs

In general, there seems to be a certain lack of focus in the training currently offered in the construction sector in general, and in the EE and RES sector in particular. The main elements/barriers identified are:

1. Too theoretical (in the classroom) and not enough practical (in real environments).
2. No clear alignment between training offer/training qualifications and specific jobs to be performed.
3. There is no continuity in certain training cycles.
4. Excessively fast pace of content/needs updating, which the training system/scheme is not able to cope with.
5. Need to train trainers themselves in the specific requirements.

Shortage of training centres

The experts conclude that there is a certain vicious circle due to the combination of, on the one hand, the lack of students, and on the other hand, the lack of centres that offer the courses required by the few students who come to the sector for training, since in the face of the shortage they tend to turn to another professional branch.

Therefore, it seems relevant to highlight, as a barrier, the lack of development of the structure generated for the occupational families of the construction and related sectors in the field of regulated training. By way of example, a cycle as a construction technician is taught in less than 30 centres throughout Spain, and specifically, the specialisation in energy and water does not exist in the training itinerary.

9. Conclusions

The methodology used to prepare the report 'Status Quo. Study on the Current Overview of the Construction Sector' has combined documentary analysis and fieldwork, both of which have been subjected to a validation phase by experts from different profiles and fields of action (educational, political, administrative, social and environmental) who have drawn conclusions on the current state of the sector in terms of energy efficiency and renewable energy, with special attention to the field of training.

Such conclusions are grouped in six types of priority or more urgent considerations, which must be considered in order to achieve the European climate and energy Objectives, referred to:

- **Energy efficiency and the use of renewable energy in general.** According to the current situation of the sector in this field, all experts see the European Green Deal, the Renovation Wave and the Next Generation EU Funds as a great opportunity to achieve the 2030 Goals and the decarbonisation of the urban environment by 2050. Half of the buildings in Spain are more than 40 years old, so the main activity for the decarbonisation of the sector necessarily involves the comprehensive rehabilitation of existing buildings. The integration of energy efficiency and renewable energies in early stages of training is valued positively and it is considered that such subjects should be offered as a specialisation, addressed to the new tools and existing concepts. They consider it essential to raise public awareness of the benefits and risks of not working in sustainable construction. Although they highlight the current availability of resources through the Next Generation EU Funds, they point out the difficulties that regional public administrations are having when it comes to managing these funds, with different speeds between Autonomous Communities.

- **The construction sector in general.** Where experts consider that there is a significant lack of workforce in the comprehensive rehabilitation segment and that there is a shortage of students in the family of building professionals, a possible response to this deficit of interest is to implement initiatives, by the administration and sectoral social agents, to improve the attractiveness of the sector. They highlight the lack of generational replacement and the high age of current professionals. The sector has aged over the last 10 years (in urgent need of a generational changeover), it is highly masculine (female rate of 9.5%), and offers an important employment opportunity for women, young people and the unemployed by improving their employability and qualifications. To increase attractiveness for the workforce, experts propose to spread the use of technologies, energy efficiency and sustainability.

- **Current regulations.** Spain has an appropriate strategic, legislative and regulatory framework to address energy objectives. According to experts, a large number of buildings in the building stock need adjustments in order to contribute more to existing climate and energy standards. Furthermore, they argue that the sector should put special emphasis on comprehensive rehabilitations, which have a greater impact than energy rehabilitations. As part of the possible

solutions, participants supported an environmental or energy-saving tightening of the building standard, which would have an impact on the necessary improvement of workers' skill levels.

- **The role of the administration.** The administration should take a step forward and open up the training offer for the benefit of energy efficiency and renewable energy pathways. They advocate the involvement of the administration to motivate and attract new workers to the construction and related sectors, and to reinforce the dissemination of vocational training and intermediate-level VET.

- **Training.** Experts advocate the need to make construction training more attractive, with better and more recognition. The accreditation of skills through experience will serve to justify existing skills and the recognition of workers' qualifications. To this end, they see it as essential to work on a model of continuous, specialised and multidisciplinary training, which allows for better integration of new developments in the sector (energy efficiency and renewable energy, industrialisation, use of BIM, etc.), and which enables the incorporation of students into the labour market. They highlight the difficulty of combining work and training. The offer of micro-skills or micro-credentials and the assessment of all training courses are part of the solutions provided. Likewise, the experts consider it relevant to highlight as a barrier, the lack of development of the structure generated for the occupational families of the construction and related sectors in the field of regulated training. And, as a handicap, the scarce presence of qualifications and centres where this type of training can be studied.

- **The most sought-after jobs.** Focusing on energy efficiency and the use of renewable energy, experts believe that the most sought-after jobs in on-site execution tasks are currently those related to installation processes (plumbing, electricity, air conditioning, etc.). However, they consider that this is insufficient and that the focus should also be placed on the Senior-level Technicians involved in a building site (designers, planners, etc.), as there are skills gaps in this area. It is necessary to inform about the productive activities of the construction sector, as well as to disseminate and publicise the occupations in the sector that are most in demand in the field of sustainable construction and energy rehabilitation.

Subsequent to this validation phase, a **forecast analysis has been conducted with construction experts, based on the Delphi technique**, with the aim of making an approximation to the expectations and needs for the sector, in terms of achieving the 2030 climate and energy goals.

The following are the most relevant general considerations, which the experts consider necessary to emphasise:

- 100% of the experts agree that, in order to achieve the 2030 Climate Goals, on the labour supply side, the most important thing is their **professionalisation**, modernisation of training and **training** of the sector, **mainly in rehabilitation activities**.

- It is necessary to improve the skills of the working population through continuing education strategies that enable the acquisition of skills and skills that favour the adaptation of women and men, as well as companies, to the productive transformations linked to the ecological transition.

- Given the ageing of the sector's active population and the sector's insufficient capacity to attract new workers, it is necessary to develop **public strategies aimed at promoting youth employment in the sector** through specific interventions, and with innovative training, work experience and dual training programmes that respond to real insertion needs.

- Half of the Spanish building stock is more than 40 years old. The rehabilitation of existing buildings therefore plays a key role in the decarbonisation of the sector. 90% of experts considers that **Spain must improve the energy efficiency of its buildings**.

- **Energy rehabilitations** are expected to generate an **annual employment growth of 10%**. The work associated with the rehabilitation of buildings requires much workforce, which is a great **opportunity to generate stable and quality employment**.

- Experts agree that occupations related to energy efficiency and the use of renewable energy will be greatly transformed in the coming years, with new technical skills leading to the reduction of energy demand in buildings.

- 80% consider that **specialists and ancillary staff** who work in energy rehabilitation or nearly zero consumption new buildings need to update their skills in energy efficiency and renewable energy; the percentage drops to 50% when considering that engineers and university technicians should do so.

- The Spanish training system must prepare itself for the present and future demands of the labour market, both because of the volume of jobs that will be generated and because of the need to respond to the new knowledge and professional skills that are being demanded or will be demanded in the coming years.

- 90% of experts consider that the sector's contribution to achieving the 2030 Climate Goals requires a **large-scale mobilisation of investment.**

- 70% of the experts consider that the **publication of directives** on the minimum required parameters for energy efficiency and renewable energy in buildings are essential for the technological progress of the sector and the quantification of the requirements needed to achieve the Goals.

- In relation to the revision and transposition of the directives on **Emissions Trading in Construction Products**, there has been a moderate level of agreement that these will accelerate emission reductions and stimulate investments in renewable energy and energy efficiency.

- 70% of experts indicate that **increasing the consumption of renewable energy** as a proportion of total gross final energy is necessary.

- 8 out of ten experts considered it important to do more **awareness raising** at the sectoral and household user level to reduce greenhouse gas emissions.

10. Authors/Contributions

The following work team has prepared this report:

- Beatriz Oliete (FLC)
- Esther Rodríguez (FLC)
- Clara García (FLC)
- Andrés Mella (FLC)
- Rosalía Sánchez (FLC)
- José Antonio Tenorio (IETCC-CSIC)
- Guillermo Sotorrio (IETCC-CSIC)
- María Ángeles Asenjo (CNC)
- Sonia Silva (CCOO del Hábitat)
- Sergio López (CCOO del Hábitat)
- Paloma Vázquez (CCOO del Hábitat)
- Ana Bernabéu (CCOO del Hábitat)
- Nuria Pérez (UGT FICA)
- Lourdes Jiménez (UGT FICA)
- Sofía Gutierrez (FUNDAE)
- Pilar Martínez (FUNDAE)
- Nuria Camacho (FUNDAE)
- Raquel Diez (GBCe)
- Lucía Masi (GBCe)
- Rodrigo Abad (INCUAL)

The consortium is grateful for the participation of the following people in the various field survey techniques, without whose contributions this report would not have been possible:

- Óscar Arroyo (Ayto. Las Cabezas)
- Ángela Baldellou (CSCAE)
- César Bartolomé (Instituto Español del Cemento y sus Aplicaciones)
- Rodrigo Burgos (FECBU)
- Teresa Carrascal (IETCC-CSIC)
- José Carlos Claro (Universidad de Sevilla)
- Marga Cousinou (FLC-Andalucía)
- Manuel Enríquez (ASOCIACIÓN SOSTENIBILIDAD Y ARQUITECTURA)
- Ana González (FLC)
- Juan Antonio Gómez-Pintado (VÍA ÁGORA)
- Bernardo García (CPIFP FLC Navarra)
- Luis Miguel Morilla (FLC ANDALUCÍA)
- Luis Fernandez (OCH Asociación de la Industrialización)
- Luis M. Franco (CONAIF Y AGREMIA)

- Víctor Pernía (CONAIF Y AGREMIA)
- Miguel Gómez Navarro (BIS S.L)
- Alberto Núñez (impermeabilizaciones IMPALAG, S.L.)
- Alfredo Gómez (Grupo Gesor)
- Carlos Martínez (PTEC)
- Carmen Sánchez-Guevara (UPM)
- Vanesa Romero (AECOM)
- Daniel Jiménez (IETCC-CSIC)
- Olga López (CCOO Fundación 1ro de Mayo –ISTAS)
- Pepa Gallardo (FLC Andalucía)
- Penélope López (Asociación de Empresas de Eficiencia Energética)
- María José Leguina (CNC)
- Javier Rodríguez (CETECO)
- Marisol Sumillera (SAINT-GOBAIN)
- Sebastián Molinero (ANDIMAC)
- Luis Mateo (ANDIMAT)
- Ángel Sánchez (IDAE)
- Vanessa Montero (AECOM)
- Juan Antonio Gallego (Autónomo y docente electricidad y fontanería)
- Mercedes Girón (FECIA)
- Juan Antonio Gómez-Pintado (VÍA ÁGORA)
- Miguel Pinto (Clúster de la Edificación)

11. Bibliography

AFEC (2023, February). *Annual market report. Climatization and HVAC* [online]. Retrieved from https://www.afec.es/documentos/AFEC-informe-de-mercado-2022-20230214.pdf

ANDIMAT (2022, June). *Andimat position paper on energy efficiency and decarbonisation* [online]. Retrieved from https://www.andimat.es/wp-content/uploads/2022/06/DOCUMENTO-DE-POSICION-ANDIMAT-SOBRE-LA-EFICIENCIA-ENERGE%CC%81TICA-Y-DESCARBONIZACIO%CC%81N.pdf.

European Year of Skills 2023 (n/a). *Objectives of the European Year of Skills* [online]. Retrieved from https://aeuropeocompetencias2023.sepe.es/Home-Anio-Europeo.

ASPRIMA (2021, January). *Sectoral Report* [online]. Retrieved from https://www.asprima.es/wp-content/asociados/INFORME-SECTORIAL-ASPRIMA-ENERO-2021-.pdf

BUILD UP Skills - Spain (2012, August). *Analysis of the national Status Quo* [online]. Retrieved from https://build-up.ec.europa.eu/sites/default/files/bus_projects/build_up_skills_status_quo_report_en_1.pdf

CEDEFOP (2021, 24 June). *Spain: more than three million workers eligible to validate their skills* [online]. Retrieved from https://www.cedefop.europa.eu/en/news/Spain-more-three-million-workers-eligible-validate-their-skills.

CEOE (2021, March). *Digital Plan 2025: the digitalisation of Spanish society* [online]. Retrieved from https://www.ceoe.es/es/publicaciones/tecnologia/plan-digital-2025-la-digitalizacion-de-la-sociedad-espanola-marzo-2021

Building cluster (2022). *Industrialised single-family dwelling* [online]. Retrieved from https://clusteredificacion.com/wp-content/uploads/2022/06/Entregable-unifamiliares-may22-v3_2.pdf

Community of Madrid (n/a). Senior-level training cycles [online]. Retrieved from https://www.comunidad.madrid/servicios/educacion/ensenanzas-formacion-profesional#grado-superior.

CONAMA2022 (2022, 22 November). *Public circular economy strategies (ST-31)* [online]. Retrieved from http://www.conama2022.org/web/generico.php?idpaginas=&lang=es&menu=370&id=320&op=view

Construction Blueprint (n/a). Reports and articles of additional interest. *Construction Skills Observatory* [online]. Retrieved from https://www.constructionskillsobservatory.eu/reports.html.

CONSTRUCTIBLE 82023, 4 May). The European Commission publishes a guide to help buildings adapt to climate change. *CONSTRUIBLE* [online]. Retrieved from https://www.construible.es/2023/05/04/comision-europea-publica-guia-ayudar-edificios-adaptarse-cambio-climatico

ECODES (n/a). *The Platform for Decarbonisation of Heating and Hot Water is created* [online]. Retrieved from https://ecodes.org/sala-de-prensa/notas-de-prensa/nace-la-plataforma-por-la-descarbonizacion-de-la-calefaccion-y-el-agua-caliente.

European Builders Confederation (2022, 8 February). *Pact for Skills in Construction: Mobilising quality investments & commitments to improve construction skills* [online]. Retrieved from https://www.ebc-construction.eu/2022/02/08/pact-for-skills-in-construction-mobilising-quality-investments-commitments-to-improve-construction-skills/.

European Commission (n/a). *2030 Climate Target Plan* [online]. Retrieved from https://climate.ec.europa.eu/eu-action/european-green-deal/2030-climate-target-plan_en

European Commission (n/a). *BUILD UP. The European portal for energy efficiency and renewable energy in buildings* [online]. Retrieved from https://build-up.ec.europa.eu/en/resources-and-tools/publications/eu-heat-pump-goals-could-significantly-reduce-our-energy-bills

European Commission (n/a). *Energy efficiency targets* [online]. Retrieved from https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-targets_en.

European Commission (2023, March). *EU-level technical guidance on adapting buildings to climate change* [online]. Retrieved from https://op.europa.eu/en/publication-detail/-/publication/7cca7ab9-cc5e-11ed-a05c-01aa75ed71a1/language-en.

European Commission (n/a). *Renewable energy targets* [online]. Retrieved from https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-targets_en.

European Commission (n/a). *Renovation wave. Renovating the EU building stock will improve energy efficiency while driving the clean energy transition* [online]. Retrieved from https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficient-buildings/renovation-wave_en.

European Commission (n/a). *Pact for Skills.* Retrieved from https://pact-for-skills.ec.europa.eu/

European Commission (2022). Education and vocational training. Educational training for today and for the future. Todo*FP* [online]. Retrieved from https://www.todofp.es/dam/jcr:7aa6919f-1ac0-44aa-a1fe-d4dcfd8c3ebb/educaci-n-y-fp--capacidadesparahoyyelfuturo.pdf

European Construction Industry Federation (n/a). *Join the pact for skills in construction!* Retrieved from https://www.fiec.eu/news/news-2022/join-pact-skills-construction.

European Federation of Building and Woodworkers (2022, 8 February). *Pact for Skills in Construction: Mobilising quality investments & commitments to improve construction skills* [online]. Retrieved from https://www.efbww.eu/publications/press-releases/pact-for-skills-in-construction-mobilising-quality-investments-a/1729-a.

Biodiversidad Foundation (2023). *Employment and ecological transition.* Sources of employment, labour transformation and training challenges in sectors related to climate change and biodiversity in Spain [online] Retrieved from https://fundacion-biodiversidad.es/wp-content/uploads/2023/05/Estudio-Empleo-y-Transicion-Ecologica -def.pdf.

GBCe (2020, September). *European Union Agenda for sustainable building construction* [online]. Retrieved from https://gbce.es/documentos/Agenda-de-la-UE-para-la-edificacion-sostenible.pdf

Gradomania (2021, 15 November). How to validate credits by accrediting professional experience or work experience in companies. *Gradomanía online* [online]. Retrieved from https://www.gradomania.com/noticias_universitarias/como-convalidar-creditos-acreditando-experiencia-profesional-o-practicas-en-empresas-org-6826.html

IDAE (2011, 16 July). *SECH-SPAHOUSEC project. Analysis of energy consumption in the residential sector in Spain* [online]. Retrieved from https://www.idae.es/uploads/documentos/documentos_Informe_SPAHOUSEC_ACC_f68291a3.pdf.

IDAE (2022, October). *Synthetic report on energy efficiency indicators in Spain. Year 2020.* [online]. Retrieved from https://www.idae.es/sites/default/files/estudios_informes_y_estadisticas/Ficha_sintesis_EE_2020_accesibilidad_OK.pdf

IDAE (n/a). *National Action Plan for Energy Efficiency 2017-2020* [online]. Retrieved from https://www.idae.es/tecnologias/eficiencia-energetica/plan-nacional-de-accion-de-eficiencia-energetica-2017-2020

NSI (n/a) https://www.ine.es/

ISTAS (2021). *Energy rehabilitation scenarios for the recovery and creation of employment* [online]. Retrieved from https://istas.net/sites/default/files/2021-05/Escenarios_rehabilitacion_energetica_recuperacion_creacion_empleo.pdf

Law 3/2023 of 28 February on Employment. Official State Gazette, No. 51, of 1 March 2023.

Law 7/2021 of 20 May on climate change and energy transition. Official State Gazette, No. 121, of 21 May 2021, pp. 62009-62052.

Law 7/2022 of 8 April on waste and contaminated soils for a circular economy. Official State Gazette, No. 85, of 9 April 2022, pp. 48578-48733.

Organic Law 2/2006, of 3 May, on Education. Official State Gazette, No. 106, of 4 May 2006.

Organic Law 3/2022, of 31 March, on the organisation and integration of Vocational Education and Training. Official State Gazette, No. 78, of 1 April 2022, pp. 43546-43625.

Ministry of Education and Vocational Education and Training (n/a). *EU reference documents* [online]. Retrieved from https://euroguidance-Spain.educacionyfp.gob.es/publicaciones/documentos-referencia-ue.html

Ministry for Ecological Transition and the Demographic Challenge (n/a). *The government approves the long-term decarbonisation strategy that sets the path to reach climate neutrality by 2050* [online]. Retrieved from https://www.miteco.gob.es/es/prensa/ultimas-noticias/el-gobierno-aprueba-la-estrategia-de-descarbonizaci%C3%B3n-a-largo-plazo-que-marca-la-senda-para-alcanzar-la-neutralidad-clim%C3%A1tica-a-2050.html

Ministry for Ecological Transition and the Demographic Challenge (n/a). *Environmental Education for Sustainability Action Plan (2021-2025)* [online]. Retrieved from https://www.miteco.gob.es/es/ceneam/plan-accion-educacion-ambiental.html.

Ministry for Ecological Transition and the Demographic Challenge (n/a). *National Integrated Energy and Climate Plan (PNIEC) 2021-2030* [online]. Retrieved from https://www.miteco.gob.es/es/prensa/pniec.html.

Ministry for Ecological Transition and the Demographic Challenge (n/a). *Energy poverty* [online]. Retrieved from https://www.miteco.gob.es/es/ministerio/planes-estrategias/estrategia-pobreza-energetica.html.

Ministry of Transport, Mobility and Urban Development (2020, June). *ERESEE 2020. Long-term strategy for Energy Rehabilitation in the building sector in Spain* [online]. Retrieved from https://www.mitma.gob.es/recursos_mfom/paginabasica/recursos/es_ltrs_2020.pdf.

Ministry of Transport, Mobility and Urban A. (n/a). *Component 2. Dwelling rehabilitation and urban regeneration plan* [online]. Retrieved from https://www.mitma.gob.es/ministerio/proyectos-singulares/prtr/participacion-mitma/c2

Ministry of Transport, Mobility and Urban Development (2023, 27 June). *The Government approves incorporating BIM methodology in public contracts to improve expenditure efficiency* [online]. Retrieved from https://www.mitma.gob.es/el-ministerio/sala-de-prensa/noticias/mar-27062023-1609

Ministry of Transport, Mobility and Urban A. (n/a). *Statistical information* [online]. Retrieved from https://www.mitma.gob.es/informacion-para-el-ciudadano/informacion-estadistica

Observation of Fundación Laboral de la Construcción (n/a) *Vocational Education and Training in Building and Civil Engineering* [online]. Retrieved from https://www.observatoriodelaconstruccion.com/uploads/media/XHrwfQ_GMK.pdf

Observation of Fundación Laboral de la Construcción (n/a) *Employed population aged 60 and over in construction* [online]. Retrieved from https://www.observatoriodelaconstruccion.com/infodatos/estatales/poblacion-ocupada-de-60-y-mas-anos-en-construccion#infografia

Order TMS/283/2019, of 12 March, which regulates the Catalogue of Training Specialities in the framework of the VET system for employment in the labour field. Official State Gazette, No. 63, of 14 March 2019, pp. 24293-24313.

Recovery, Transformation and Resilience Plan (n/a). *Recovery Plan Implementation Report* [online]. Retrieved from https://planderecuperacion.gob.es/ejecucion/informe-de-ejecucion-del-plan

Recovery, Transformation and Resilience Plan (n/a). *Lever policies and components* [online]. Retrieved from https://planderecuperacion.gob.es/politicas-y-componentes

Proposal for a Directive (EU) of the European Parliament and of the Council of 15 December 2021 on the energy performance of buildings. Final COM/2021/802.

Royal Decree 143/2021, of 9 March, amending Royal Decree 1224/2009, of 17 July, on the recognition of professional skills acquired through work experience. Official State Gazette, No. 59, of 10 March 2021, pp. 27628-27632.

Royal Decree 178/2021, of 23 March, amending Royal Decree 1027/2007, of 20 July, approving the Regulation on Thermal Installations in Buildings. Official State Gazette, No. 71, of 24 March 2021, pp. 33748 to 33793.

Royal Decree 450/2022, of 14 June amending the Technical Building Code, approved by Royal Decree 314/2006 of 17 March. Official State Gazette, No. 142, of 15 June 2022, pp. 81973-81989.

Royal Decree 694/2017, of 3 July, which implements Law 30/2015, of 9 September, which regulates the Vocational Education and Training System for Employment in the field of employment. Official State Gazette, No. 159, of 05 July 2017, pp. 56864-56899.

Royal Decree 732/2019, of 20 December amending the Technical Building Code, approved by Royal Decree 314/2006, of 17 March. Official State Gazette, No. 311, of 27 December 2019, pp. 140488-140674.

Royal Decree 984/2021, of 16 November, which regulates assessment and promotion in Primary Education, as well as assessment, promotion and qualifications in Compulsory Secondary Education, Baccalaureate and Vocational Education and Training. Official State Gazette, No. 275, of 11 November 2021, pp. 141583-141595.

Royal Decree 1027/2007, of 20 July 2007, approving the Regulation on Thermal Installations in Buildings. Official State Gazette, No. 207, of 29 August 2007, pp. 35931-35984.

Royal Decree 1224/2009, of 17 July 2009 on the recognition of professional skills acquired through work experience. Official State Gazette, No. 205, of 25 August 2009, pp. 72704-72727.

Council Recommendation of 24 November 2020 on vocational education and training (VET) for sustainable competitiveness, social equity and resilience. (2020/C 417/01).

Regulation (EU) 2021/1119 of the European Parliament and of the Council of 30 June 2021 establishing the framework for achieving climate neutrality and amending Regulations (EC) No. 401/2009 and (EU) 2018/1999 ("European Climate Legislation"). PE/27/2021/REV/1.

Resolution of 23 July 2022, of the Directorate General for Labour, registering and publishing the Agreement amending the 6th General Collective Bargaining Agreement for the construction sector. Official State Gazette, No. 187, of 5 August 2022, pp. 115263-115286.

Renovate Europe (n/a). *National supporting partner of the campaign* [online]. Retrieved from https://www.renovate-europe.eu/national-initiatives/Spain/.

Renovate Europe (2022, October). *Speeding up the delivery for renovation: investing in skills* [online]. Retrieved from https://www.renovate-europe.eu/wp-content/uploads/2022/10/REC_E3G_Skills-brief_Final_Oct2022.pdf

Voz Pópuli (2023, 11 June). Europe forces Spain to explore its 'rare earth' mines to stop China. *Voz Pópuli online* [online]. Retrieved from https://www.vozpopuli.com/economia_y_finanzas/minas-tierras-raras-espana.html.

12. Glossary

Formal learning or education: Structured training process leading to an official qualification, accreditation or certification.

National Catalogue of Occupational Skills Standards (modification of the current National Catalogue of Occupational Qualifications, NCPQ): Instrument of the SNCFP that orders the standards of occupational skills identified in the productive system, according to the appropriate skills and the standard of quality required for professional practice, which can be recognised and accredited.

Professional certificate or occupational certificate: Instrument that accredits, in the labour sphere, the set of occupational skills that a person must possess in order to conduct a work activity identified in the labour market.

Population and Dwelling census: Study to find out the social and demographic characteristics of the population. It results in the demographic characteristics, education, employment status, and migrations of the entire population. Information on household composition and size. And finally, information on surface area, year of construction and other information on the dwellings.

Life cycle of the building: It consists of the different phases a building goes through during its lifetime from construction to decommissioning. The reference in the definition of the stages, and each of their phases, which make up the building life cycle are defined in the European standard EN 15978.

Sectoral Joint Committees (PSCs): Bodies for the participation of employers' and trade union organisations in training for employment. They are constituted through collective agreements or specific agreements and are made up of the most representative employers' and trade union organisations in the framework of sectoral collective bargaining at state level.

Occupational skills: Set of knowledge and skills that enable the exercise of professional activity pursuant to the requirements of production and employment. The vocational skills are set out in the vocational skills standards, which will be used for the design of any vocational training offer.

Autonomous community: A territorial entity which, within the current legal system established by the Constitution, is endowed with autonomy, has its own institutions and representatives, as well as legislative, executive and administrative powers, whether exclusive or shared.

Life Cycle Cost (LCC): Cost of an asset or its components over its life cycle, while maintaining its performance requirements.

Qualification: Competence to perform a professional activity officially attested by diplomas, certificates or accreditations.

Digitisation: The process by which analogue processes and physical objects are converted into digital format, i.e. digitisation is the procedure by which certain operations can begin to be conducted through digital media.

Ecodesign: Technique used in the design of a product or service, which takes into account environmental factors, so that measures are implemented to ensure that its production does not have negative effects on the environment. This reduces the environmental impact of products or services throughout their life cycle, from design to disposal.

Circular Economy: Economic model that uses the minimum number of natural resources necessary to satisfy the needs required at any given time. Thus, it selects resources intelligently, avoiding non-renewable resources and critical raw materials, favours the use of recycled materials - whenever possible and whenever they serve a specific purpose - and efficiently manages the resources used, maintaining and recirculating them in the economic system for as long as possible, creating added value.

Gross energy available: Amount of energy available to meet the country's domestic consumption.

Final energy: Energy directly consumed by the user, i.e. the energy that finally reaches the consumer and for which data is available from meters or suppliers.

Primary energy: Total amount of energy resources consumed, either directly or for transformation into another form of energy. It is usually calculated by applying a conversion factor to the final energy, which is a function of the energy vector used, so that the primary energy takes into account not only the final energy, but also transformation losses and transport losses.

Training speciality: Grouping of occupational skills, contents, and technical specifications that respond to a set of work activities framed in a phase of the production process and with related functions, as well as to the acquisition of transversal skills necessary for the adequate performance in the occupational environment and context.

Occupational Family: Set of productive activities grouped by similarity and which make up the structure of the National Catalogue of Occupational Qualifications. In addition, the productive activities belonging to each of the families are, in turn, grouped into professional areas in response to criteria of affinity of occupational skills. There are currently 26 occupational families.

Continuing Training: Any type of training undertaken after initial training and entry into working life, within or outside the education system. Its aim is to enable the person to acquire, extend or update their knowledge or skills with a view to adaptation, professional promotion or reconversion of their personal or professional development pathway. This denomination is not associated with the type of training offer, but with the learning process in the training itinerary of each person, after the initial training and the incorporation into active working life.

Fundación Estatal para la Formación en el Empleo, (Fundae): Public sector entity that manages public funds allocated to training for the strengthening of the productive fabric and employment in Spain.

Spanish Qualifications Framework: An instrument that guides the coherent levelling of qualifications for their classification, linking and comparison and that also serves to enable the mobility of people in the European area and in the international labour market.

BIM methodology: Building Information Modelling (BIM) is a digital and collaborative working methodology that uses digital 3D models as the basis for planning, designing, managing and constructing construction projects. It aims to centralise all project information in a digital information model created by all project stakeholders.

Sectoral reference plan: Set of training specialities from the SEPE's Catalogue of Training Specialities considered a priority for each sector, and which can be financed in the calls for subsidies.

General Register of Vocational Education and Training Centres: Electronic administrative register under the Ministry of Education and Vocational Education and Training, which will include all the centres authorised to provide any vocational training offer of the Vocational Training System. This register is constituted on the basis of the data on the educational centres included in the autonomous registers of the competent administrations, where applicable, where their facilities and training resources are located.

Energy rehabilitation: Energy rehabilitation is rehabilitation that involve improving the energy efficiency of the building and/or adopting new renewable energy sources in the building. Energy rehabilitation is usually a combination of several interventions on the envelope, ventilation control, efficiency of thermal installations and implementation of renewable energy.

Comprehensive rehabilitation: A comprehensive rehabilitation consists in adapting the structure and functionality of a building, considering various aspects such as structure, safety, existing pathologies, energy efficiency, accessibility, comfort, etc.

Senior-level Technician: Level 5 (EQF) broad factual and theoretical expertise in a particular field of work or study, while being aware of the limits of that expertise.

University Degrees: Level 6 (EQF) Advanced knowledge in a field of work or study requiring a critical understanding of theories and principles.

University Master's degrees: Level 7 (EQF) Highly specialised knowledge, some of it at the forefront of a particular field of work or study, laying the foundations for original thought or research, critical awareness of knowledge issues in a particular field and at the interface between different fields.

PhD degrees: Level 8 (EQF): Knowledge at the most advanced frontier of a particular field of work or study and at the point of articulation between different fields.

Index of Figures

Index of Photographs

Index of Tables

Index of Charts

Anex 1. Information on dwellings built

YEAR	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	ACCUMULATED
New dwellings	45,152	40,119	54,610	64,354	78,789	85,945	91,390	89,107	104,709	99,047	102,687	106,327	109,967	113,607	117,247	120,887	**1,054,975.66**
Upper confidence limit							91,390	89,107	118,860	113,198	116,838	120,478	124,118	127,758	131,398	135,038	**1,168,184**
Lower confidence limit							91,390	89,107	90,558	84,896	88,536	92,176	95,816	99,456	103,096	106,736	**941,767**
ERESEE-PNIEC Objective							99,000	105,930	113,345	121,279	129,769	138,853	148,572	158,972	170,100	182,007	**1,367,040**
Rehabilitations	25,413	26,094	26,024	26,017	28,533	25,294	27,189	24,102	25,902	25,862	25,822	25,782	25,742	25,701	25,661	25,621	**257,385**
Upper confidence limit							27,189	24,102	26,818	26,778	26,738	26,698	26,658	26.,17	26,577	26,537	**264,712**
Lower confidence limit							27,189	24,102	24,986	24,946	24,906	24,866	24,826	24,786	24,745	24,705	**522,097**
Objective - ERESEE-PNIEC							30,000	35,000	40,000	45,000	50,000	100,000	150,000	200,000	250,000	300,000	**1,200,000**