



SECTORIAL STRATEGIC APPROACH TO COOPERATE ON SKILLS IN THE CONSTRUCTION INDUSTRY

**WP2. Status Quo and Sectorial Skills
Strategy;
Deliverable 2. Status Quo**



Version: 3

Date: 09.12.2020

Author: FLC



Co-funded by the
Erasmus+ Programme
of the European Union



Co-funded by the
Erasmus+ Programme
of the European Union

ERASMUS+ Programme

Key Action 2 | Call 2018

COOPERATION FOR INNOVATION AND THE EXCHANGE OF GOOD PRACTICES
SECTOR SKILLS ALLIANCES FOR IMPLEMENTING A NEW STRATEGIC APPROACH
("BLUEPRINT") TO SECTORAL COOPERATION ON SKILLS

Project number:

600885-EPP-1-2018-1-ES-EPPKA2-SSA-B

PARTNERSHIP		
VET PROVIDERS	SECTORAL REPRESENTATIVES	COUNTRY
FLC (COORDINATOR)	CNC	SPAIN
IFAPME	CONFÉDÉRATION CONSTRUCTION	BELGIUM
SATAEDU	--	FINLAND
CCCA-BTP	FFB	FRANCE
BZB	ZDB	GERMANY
BFW-NRW		
AKMI	PEDMEDE	GREECE
LIT	--	IRELAND
FORMEDIL	ANCE	ITALY
VSRC	LSA	LITHUANIA
CENFIC	--	PORTUGAL
SCKR	CCIS CCBMIS	SLOVENIA
	BUDOWLANI (TRADE UNION)	POLAND
	FIEC	EU
	EFBWW	EU
	EBC	EU

The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

INDEX

1. INTRODUCTION	2
2. METHODOLOGY	4
3. DESCRIPTION OF THE CONSTRUCTION INDUSTRY PER COUNTRY& STATISTICS	5
4. KEY AREAS OF INTERVENTION	26
4.1. DIGITALISATION	26
4.2. CIRCULAR ECONOMY	33
4.3. ENERGY EFFICIENCY	38
5. SKILLS GAPS AND TRAINING NEEDS	45
6. BARRIERS	60
6.1. POLITICAL / LEGISLATIVE	60
6.2. ECONOMIC / SOCIAL.....	61
6.3. STRUCTURAL	63
6.4. EDUCATION	64
7. REFERENCES	67

1. INTRODUCTION

Blueprint for the Construction Industry is a European initiative funded by the Erasmus+ Sector Skills Alliance Programme, launched by the European Commission in 2017 for the period 2019-2022 and led by the Fundación Laboral de la Construcción (FLC) - Spain. It gathers 3 EU sectoral organizations, along with 9 national sectoral representatives and 12 Vocational and Education Training providers from 12 EU countries for working together in order to develop a new sectoral strategy for skills in the construction industry at European level. The aim is to support a better match between company skill needs and skills provided.

The following activities will be developed during the project:

- Collecting good practices at national and regional level to illustrate and promote initiatives addressing skill gaps.
- Creating an observatory to provide valuable information about specific skill needs at least at regional/national level.
- Revision of construction occupations and professional profiles and design and testing of training actions specially focused on new skills drivers: digitalization, energy efficiency and circular economy.
- Carrying out an outreach campaign for the Construction industry to promote its attractiveness among young people and women, identifying and promoting solutions to facilitate mobility of construction workers in Europe.
- Creating a new virtual tool (SSA Portal) where all project outputs will be available for stakeholders, as well as a Sector Skills Alliance platform for collaborative work.

As a first step of the project, within WP2, led by Formedil (Italy) and Sataedu (Finland), the partners have participated in the elaboration of two different tasks aiming at collecting information on the elements that can contribute to shape a first approach concerning the setting up of a Sectorial Skills Strategy:

- PESTLE analysis, to define Political, Economic, Social, Technological, Legal and Environmental factors, which may affect sectoral skills.
- Status Quo, whose aim is to set the scene and the state of play of the construction industry in the countries involved.

Both activities are inter-related, since they deal with same topics from different perspectives, and provide information coming from different sources (primary and secondary) about the main aspects and topics affecting the construction industry in the EU, and their relationship with professional skills needs and VET.



The information and results from these activities have led to the design of a Sectorial Skills Strategy for the construction industry which will include a Strategic Action Plan and Roadmap to be deployed during the time period of the Blueprint and beyond its finalization¹.

The current document focusses on the Status Quo, aiming at analysing the current situation of the construction industry in the contributing countries.

¹ These documents may be found and downloaded at <http://constructionblueprint.eu/results/>

2. METHODOLOGY

Construction Blueprint partners have contributed to the preparation of the status quo providing their input on the following topics:

- General description of the construction sector & statistics
- Key areas of intervention: Digitalisation, circular economy and energy efficiency.
- Skill gaps and training needs.
- Barriers, distinguishing among:
 - Political / legislative
 - Economic / Social
 - Structural
 - Education

Formedil, as leader of this task, and FLC, as coordinator of the project, have analysed all the documents received and made a general and homogeneous description of the aspects of the construction sector in Europe among the contributing countries (Belgium, Finland, France, Germany, Greece, Ireland, Italy, Lithuania, Slovenia, Spain and Poland). The project partners that have contributed to the realization of this description are vocational training centres, some of them responded with the collaboration of employers' associations.

After the revision of this report by the EACEA, some improvements have been made in order to adjust the content of the report to the latest analysis and findings already drawn up mainly by the European Construction Sector Observatory for the involved countries.

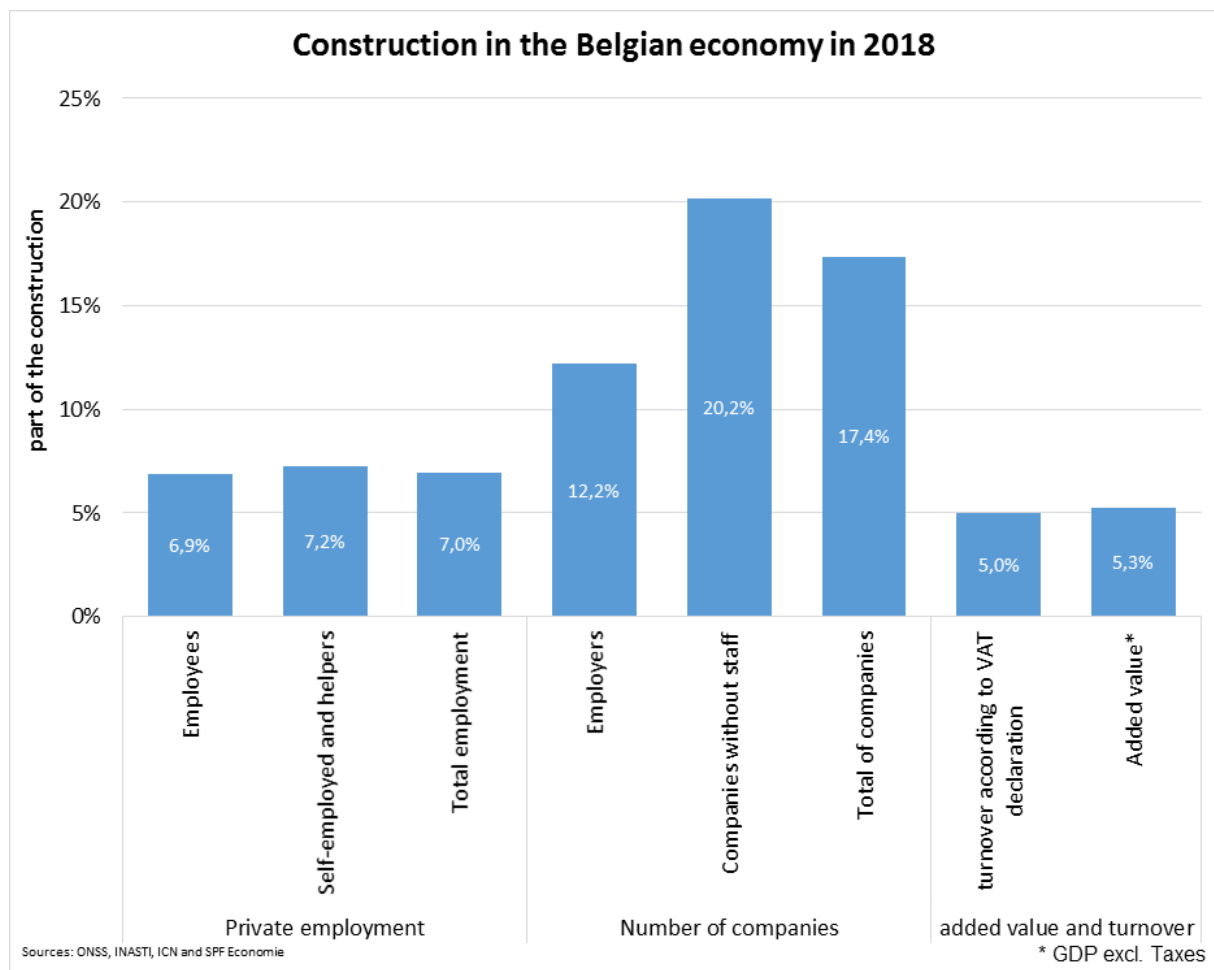


3. DESCRIPTION OF THE CONSTRUCTION INDUSTRY PER COUNTRY² & STATISTICS

Belgium

In Belgium, construction industry is a particularly important professional stakeholder with a relevant contribution to the economy of the country. The GDP of Belgium amounts to EUR 437,600 million (2018)³ of which 5.3% of the added value is represented by the Belgian construction industry.

That contribution to the GDP is produced by the 112,482 construction companies in the country which generated 7% of private employment.



Nevertheless, the number of construction companies is increasing significantly in Belgium. According to data from 2018, there are 17 large construction companies (more than 500 employees), 3.976 SMEs (from 499 to 11 employees) and 108.489 micro-companies (less than 10 employees)⁴. This increase mainly concerns companies without staff, the number of employers in construction remaining fairly

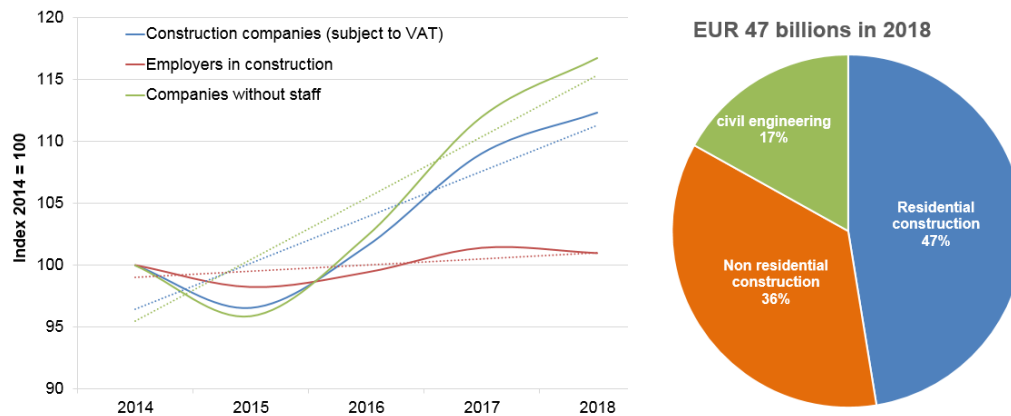
² Economic contribution to the GDP, number of workers and construction companies, number of women and migrants working in the sector, forecasts etc...

³ National Account Institute

⁴ Stable and National Social Security Office

stable. In the last 5 years, the number of self-employed and helpers has increased significantly in construction reaching 72.200 people in second trimester 2019⁵. After a difficult period that lasted some years, salaried employment in construction once again increased by 278.600 (salaried and self-employed) people in 2019. In addition, a relevant data to highlight is that unemployment figures continue constant- 5.4%. In addition, it should be mentioned that from the total amount of employees in the sector, just 16,808 are women which means 8.4% of the sector.

In 2018, construction work totalled EUR 47 billion. Residential construction accounted for about half (47%), non-residential construction was 36% while civil engineering accounted for 17%.



Although construction industry has been timidly recovering since the economic crisis in 2008 – approximately 1.7% of growth over the years - the estimations for the future are not very encouraging since a negative growth of -1% is foreseen for 2020⁶.

Finland

The construction industry is the foundation of Finnish well-being and competitiveness. Finland’s GDP is approximately EUR 234 billion in 2018⁷, of which the contribution of the construction industry is approximately EUR 14 billion, that is, 6%⁸. Nearly three-quarters of Finland’s national wealth is therefore tied to buildings, thoroughfares, and networks. The value of construction output in 2018 totalled EUR 35 billion. Of this, construction accounted for EUR 28.2 billion and civil engineering for EUR 6.8 billion. The need for workforce in the sector is unevenly distributed across the country, with construction focusing on growth centres.

Construction and maintenance of the sector provide jobs for every fifth employed in Finland, that is, approximately 252,000 people in the whole construction industry⁹.

⁵ National Account Institute

⁶ Euroconstruct

⁷ Confederation of Finnish Construction Industry RT (CFCI RT)

⁸ CFCI RT

⁹ Statistics Finland / CFCI RT

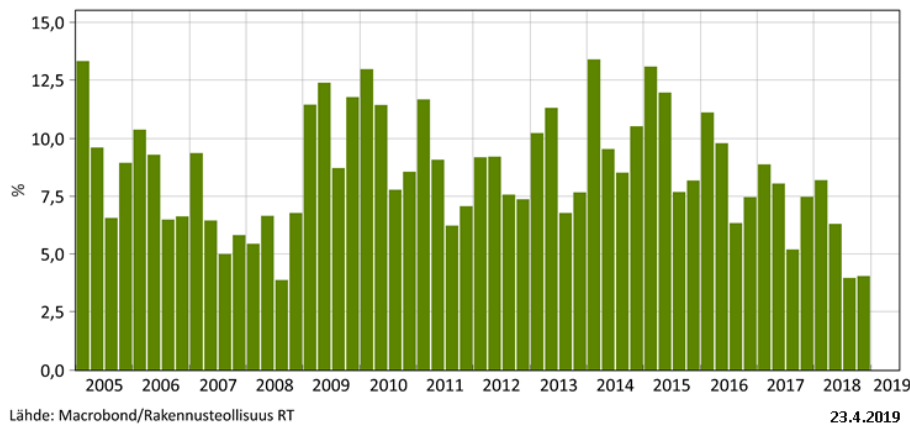


The number of employed in the construction sector is about 175,000 – 185,000. Included are employees in building construction, infrastructure construction and special contracting, as well as officers and entrepreneurs. Of these, civil engineering, i.e., infrastructure construction, directly employs between 45,000 and 50,000. In addition, the construction products industry employs about 80,000 workers. More in details, of the total amount of construction workers, 8.6% are women and approximately 20% are foreign workers. The age of the workers should also be outlined: 25% of them are less than 30 years old, 55% between 30 and 55 years and 15% more than 55 years old.

On the other hand, unemployment has decreased over the period considered – 6,762 in 2019, that is 14.5% of which 6,242 are men and 520 women¹⁰.

Unemployment rate in the construction sector in years 2005-2018:

Rakentamisen työttömyysaste (Tilastokeskuksen työvoimatutkimus)



In Finland, the need for renovation of residential buildings in 2016–2025 is EUR 9.4 billion annually. Approximately 70% of the need for repairing is conventional repair of parts due to wear, aging and damage. 23% is annual repair or start-up maintenance. The remaining 7% is spent on repairing moisture damage and improving accessibility.

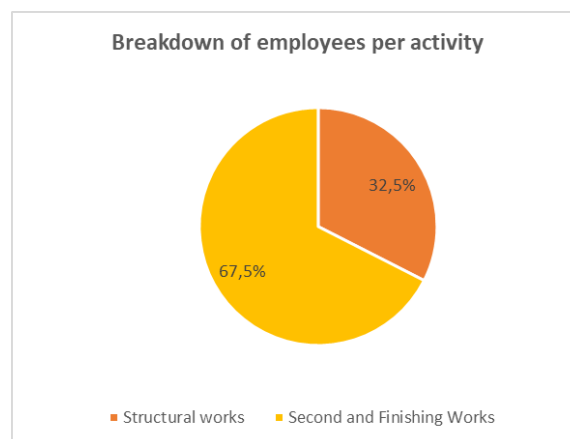
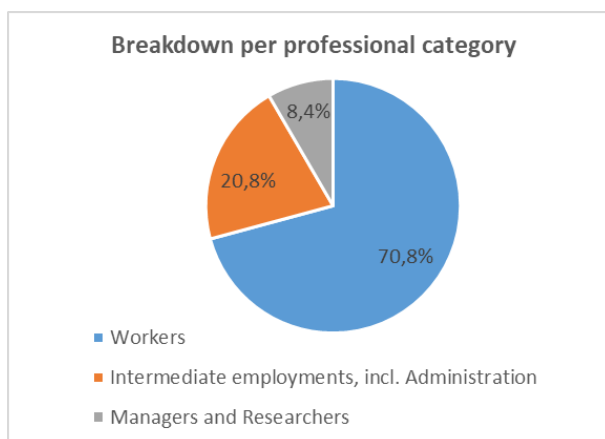
France

According to the figures published by the FFB in May 2019, the construction sector in France gathers 394,000 companies that hire 1,104,000 salaried employees. They represent 6.4% of the total number of employees in France at the end of 2018.

	Size of Building companies				TOTAL
	0-10 empl.	11-50 empl.	51-200 empl.	More than 200 empl.	
	373 000	19 500	1 300	200	394 000

¹⁰ Construction Unemployment Fund.

Number of Companies	94,7%	4,9%	0,3%	0,1%	100%
Employees	437 000	360 000	149 000	158 000	1 104 000
	39,6%	32,6%	13,5%	14,3%	100%
Production France (Billion €)	50	45	22	23	140
	35,7%	32,1%	15,7%	16,4%	100%
<i>Source: FFB, May 2019</i>					



Among the salaried employees, women represent 12.3% of the workforce. They are mainly recruited in the administrative jobs (78%), but their share in the management and research tends to increase slightly since 2000 (from 8.3% to 13.2% in 2018)¹¹.

Besides, the Public works sector (i.e. infrastructures), distinct from the construction sector in France, gathers 8 000 companies and 300,000 salaried employees for a total turnover of EUR 41 billion for 2018¹².

In 2019¹³, the construction sector should produce EUR 140 billion and represent almost 6% of the EUR 2,346 billion French GDP.

In comparison, the construction sector represents, for the French economy, half of the weight of the industry and twice as much as the banking and insurance activities. Out of the EUR 140 billion of production, new buildings construction represents 45% of the activity, while the maintenance and renovation of buildings the remaining 55%.

Considering the weight of the construction sector in France, EUR 1 billion of works generates the creation of almost 10,000 new jobs in the sector, of which we could add almost 7,000 jobs created in the sectors close to the Building industry such as the products, materials and construction equipment sector.

¹¹ Source : Les indicateurs sociaux du Bâtiment - FFB (June 2019)

¹² Source: FNTP (Fédération Nationale des Travaux Publics) figures - www.fntp.fr/data/secteur-en-chiffres/france/activite

¹³ Source : INSEE (Statistical Research institute) and FFB



Compared to 2018, business and micro-enterprise start-ups continued to grow strongly in the first quarter of 2019, with failures returning to low levels¹⁴.

Germany

Since 2010, the investments in the German construction sector have increased by 100%. Construction companies are investing more than the rest of the economy.

The drivers of this development are the sustainable demand in residential construction and the expansion of public infrastructure. Demand in the residential construction segment resulted from continued internal migration to metropolitan areas and a marked lack of completion in the years of crisis until 2005.

Nowadays, the construction sector is one of the most important pillars of Germany's economy whose nominal GDP totalled EUR 3,388 billion in 2018. Construction activities amount to 5.34% in relation to Gross Value Added (GVA) of Germany or 10.4% related to the nominal GDP¹⁵. The sector is interlinked with many other sectors and also closely linked to a variety of trades. It is transdisciplinary as it touches economically and societally highly important areas. Among others, it is worth mentioning energy efficiency, climate protection, circular economy, digitalization and training of skilled professionals in a large variety of disciplines. The German construction sector comprises two main branches: main construction trades (MCT) and finishing trades (FT).

In general, the construction sector in Germany is booming. Main drivers for the boom are the construction of houses and public contracting/procurement for infrastructural projects, but also commercial housing and energetic restoration of the building stock.

Nearly two million people are employed in Germany in the construction sector including enterprise owners, co-owners and apprentices¹⁶. Only 13% of the construction workforce are women, 50% of them are working part time¹⁷. 5.6% of Germany's entire workforce is employed in construction, 18% of them are foreigners and the average age is 43 years. In 2018 the nominal construction volume amounted to EUR 400 billion¹⁸. The main construction trades (MCT) branch has about 75,000 active enterprises while in finishing trades (FT) about 252,000 enterprises are active¹⁹. In FT, as well as MCT, mainly SMEs are active: more than 90% of enterprises in both sub-sectors have less than 20 employees. The gross fixed capital formation amounts to EUR 352 billion while housing drives these investments. For 2019, estimations forecast a growth of more than 7%. This trend will continue with an estimated growth rate of more than 6%.

Important figures (2018, in Euro) in the country are:

- Overall construction volume: 400 billion.
- Housing: 230 billion, thereof 73 billion for new housing, 157 billion for building stock.

¹⁴ information provided by the French Construction and Public Works Observatory

¹⁵ Statistisches Bundesamt (2019): Bruttoinlandsprodukt 2018 für Deutschland, p. 11 et seq.

¹⁶ BBSR (2019) - Bericht zur Lage und Perspektive der Bauwirtschaft 2019, p. 4

¹⁷ Bundesagentur für Arbeit (2019) - Der Arbeitsmarkt in Deutschland 2018, p. 162

¹⁸ BBSR (2019) - Bericht zur Lage und Perspektive der Bauwirtschaft 2019, p. 2

¹⁹ ibd., p.4

- Commercial, industry and agricultural construction: 81 billion building construction, 34 billion civil engineering.
- Public sector: 21 billion building construction, 34 billion civil engineering.
- Women remain underrepresented in construction. Their share amounts to 13% (240,318) compared to the workforce while roughly half of them only pursue part time jobs in construction. This is mainly office work rather than crafts work.
- In 2018 18% of the employees in the construction sector were foreigners.
- The average age in building construction is 43 years old²⁰.

For the year 2019, the ZDB expects a turnover development in the construction industry at +8% compared to the same period last year. However, sales growth is foreseen in all construction sectors.

Demand in the housing sector, which is particularly evident in the metropolitan areas is sustainable. This development also proliferates to surrounding areas now. The good employment situation in the national economy and the low financing costs continue to strongly support demand. The completion of approximately 300,000 to 310,000 residential units in the years 2019 and 2020 respectively are expected. The development is supported by multi-storey housing construction. The German Baukindergeld will support the construction of small residential homes in 2019 and 2020.

For commercial construction, the result is an ambivalent picture. While the leading indicator "building permits" already points to a slowdown in investment propensity, orders are currently being processed in large volumes.

In public construction, civil engineering, with a share of 80% of turnover, is of paramount importance. From 2015 to 2023, federal investment in infrastructure is expected to increase from over € 10 billion to over € 17 billion, or around 70% (in 2018, a level of over € 14 billion was achieved). The increase is appropriate in view of existing deficits, but also ambitious both on the part of the public sector, as well as in the implementation of projects by the construction industry.

Generally, there will be mostly optimistic prospects for the business development in the year 2020. On the one hand, the implementation of the German Federal Government's legislative initiative on tax incentives for energy-saving measures is providing momentum for the renovation market - and thus especially for the construction industry. This is a measure which has been discussed since 2011 and which must be implemented if the goals of the climate protection program are to be achieved. On the other hand, the subdued assessments of the economic outlook of the German industry, rising costs for wages and materials, as well as the continuing shortage of labour, give reason to assume that business development in the construction industry is slowing down.

Even if the momentum of sales growth slows down somewhat, the construction industry remains the growth driver in the German economy.

Greece

²⁰ Statistisches Bundesamt:
https://www.destatis.de/DE/Presse/Pressemitteilungen/2018/11/PD18_448_122.html



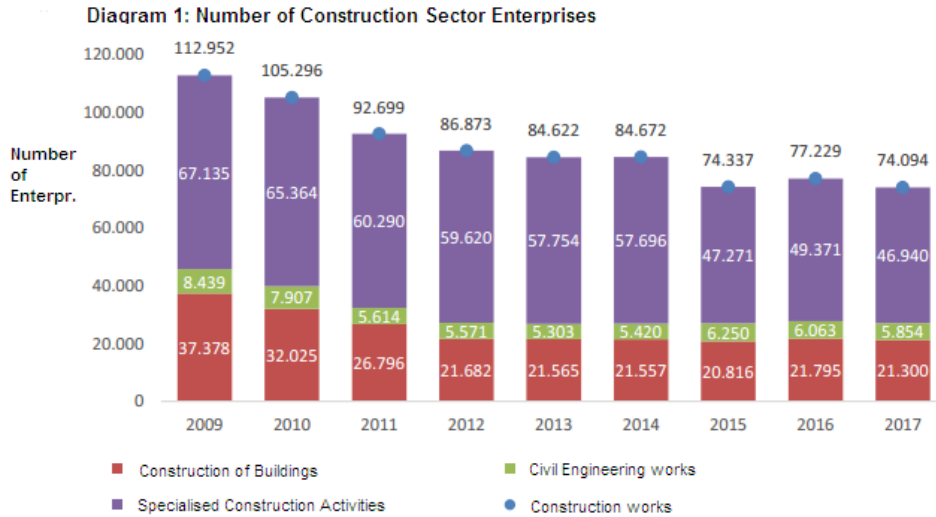
The construction sector in Greece grew rapidly from the early 1990s to 2007, increasing significantly its influence on the Greek economy and positively contributing to its growth. However, the adverse macroeconomic conditions and fiscal adjustment that took place in recent years had a catalytic effect on the course of the industry. Cutting public and private investment, lack of liquidity and bank financing, shrinking disposable income, uncertainty about the future, and a drastic increase in the tax burden on real estate have led Greek construction industry into a bad financial state.

The capacity of the industry in human resources, capital equipment and know-how, under the existing conditions, is devalued. Many companies (technical companies, manufacturing and marketing companies for construction products and materials, design offices etc.) either have been shut down or are under-operational. The shrinking of investment rate in Greece, which mostly concerns the construction sector, triggered but also largely expressed the deep recession that Greek economy has undergone in the recent years. Total fixed capital formation declined from 26% of GDP in 2007 to just 11% of GDP in 2018.

At the same time, the share of residential and other construction investment in total fixed capital investment declined from 56% in 2007 to 38% in 2018, i.e. construction investment declined much more than other fixed capital investments. This is mainly due to the share of investment regarding the construction of new houses, which actually collapsed (from EUR 25.2 billion in 2007 to EUR 1.2 billion in 2018), and less on investments in other construction, which have decreased from EUR 8.9 billion to EUR 6.6 billion in the same period.

On the other hand, however, there seem to be areas of intervention through which a major recovery of the construction sector could be pursued as well as the maximization of its contribution to the reconstruction of the national economy. Although it is unreasonable for several reasons to expect in the medium term a recovery of investment in dwellings of the same level as in the past, it is clear that, compared to other European economies, the "vacancy" of economic activity and employment that has been created in the sector, as well as in other related industries, means that without a significant strengthening of the construction activity it is not possible to reach the required level. In absolute figures (current prices) the decrease that took place was from EUR 60.5 billion in 2007 to EUR 20.5 billion euro in 2018.

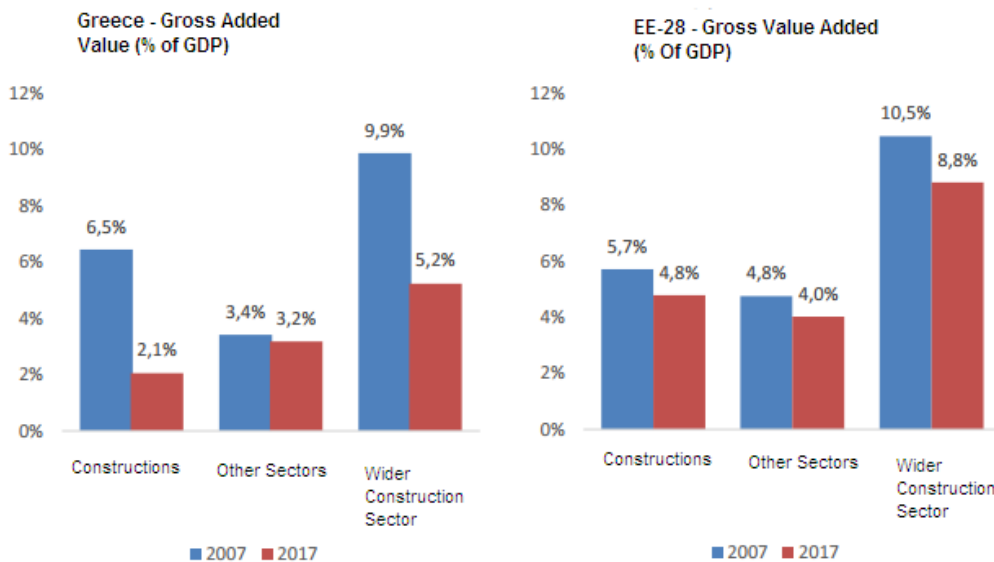
In Greece, about 74,100 enterprises were active in 2017. Nearly 2 out of 3 businesses were active in the field of specialized construction work, while 29% of enterprises had as their main object the construction of buildings. However, significantly smaller is the number of civil engineering firms (8% of the total).



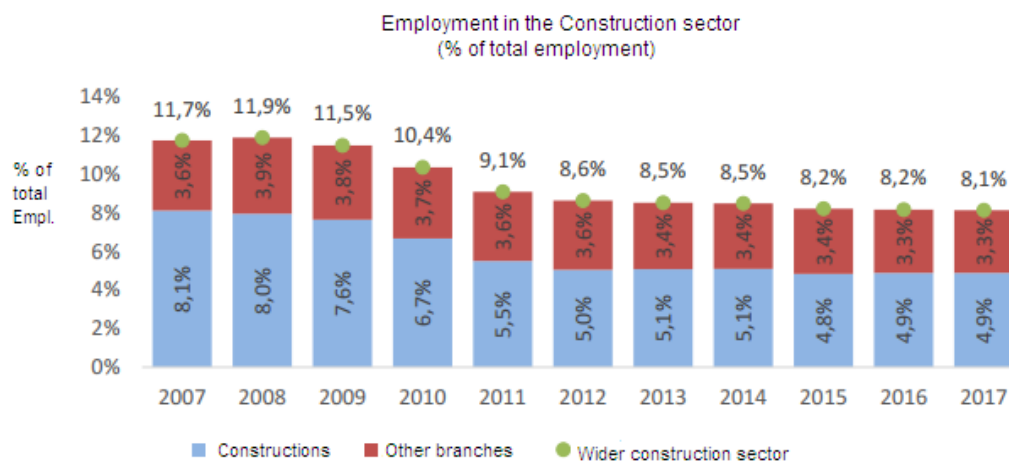
The added value of the construction sector amounted to 5.2% of GDP in 2017. The construction sector alone generated added value that accounted for 2.1% of GDP, compared to 6.5% in 2007.

The rest of the construction sector constrained (as a whole) their losses to the same level, thus maintaining their relatively stable GDP (3.2% of GDP in 2017 whereas 3.4% in 2007). As a result, the participation of the construction sector in Greece's GDP fell from almost 10% in 2007 to 5.2% in 2017. Constructions declined over the same period in the EU28 but to a lesser extent than in Greece. More specifically, in 2017, it stood at 8.8% of GDP, from 10.5% of GDP in 2007, with the construction industry dropping slightly over the rest of the construction sector.

Diagram 3: Gross Added Value of Construction Sector as % of GDP in Greece and EU28



The share of employment in the construction sector decreased from 8.1 % in 2007 to 4.9% in 2017, while other sectors of the Construction sector remained relatively stable when it comes to total employment. More recent data available states that the total number of construction workers was 151.600 for 2018²¹.



Regarding other relevant data in the industry, 9,099 women were working in the sector during 2018²² which means that only 6% of the total workers are women. In addition, from the total number of workers in the industry, 2% are migrants from other Member States and around 17% come from third countries²³.

Ireland

The Irish construction sector has gone through a period of extremes in the last decade, from an exceptionally high growth to deep and prolonged recession. The construction labour market, however, remains in a state of disequilibrium.

In Ireland, the added value in the Construction sector recorded in 2018 an increase of 30.7% in real terms. The Central Statistics Office, CSO indices, published in June, show the value of construction output reached approximately EUR 21 billion in 2018 or just under 7.4% of GDP²⁴ from preceding period. This reflects increases of 5.6%, 5.5% and 1.1% in the volume of residential building work, non-residential building work and civil engineering work respectively. This represents growth of almost 64% in the last three years.

As the Irish economy continues to grow, so too does the construction industry. With GDP growth levels of 4.7% predicted by the Economic and Social Research Institute, ESRI in 2018, Ireland will have the fastest growing economy in the EU, with rates at almost twice the Eurozone average.

Figure X - Construction Output 2013-2019

²¹ <https://www.statistics.gr/en/statistics/-/publication/SJO03/->

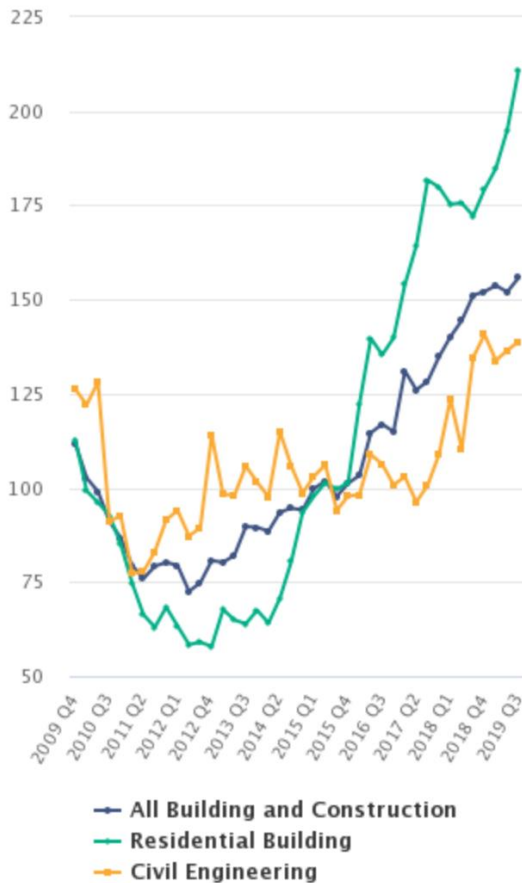
²² <https://www.statistics.gr/en/statistics/-/publication/SJO03/->

²³ <https://www.statistics.gr/en/statistics/-/publication/SJO03/->

²⁴ Central Statistics Office CSO; Quarter 4 2018 and Year 2018 (Preliminary); Mar 2019

	2013	2014	2015	2016	2017	2018	2019(f)
Value of output at current prices (€m)	9,723	11,147	12,650	14,935	17,500	20,800	23,000
Change in value of output (%)	3.0%	14.6%	13.5%	18.1%	17.2%	18.9%	10.6%
Construction output as % of GNP	6.1%	6.4%	6.4%	6.7%	7.5%	8.2%	8.7%

Source: DKM/CSO/CIF/Linesight



The construction industry is seeing commercial office space, office fitouts, hospitality, retail, data centre and industrial projects, as well as residential programs, contributing to the growth of the sector in Ireland. The public CAPEX programme and Project Ireland 2040 should also provide the necessary investments in infrastructure to support much needed housing in a country with an escalating population. The level of activity in the overall construction sector has increased by 2.5% in Quarter 2 2019. Residential Building has seen the largest increase with a rise of 8.2% in the seasonally adjusted volume index. Non-Residential Building is also up on the previous quarter with an increase of 2.2% in volume while Civil Engineering is up 1.7% in the seasonally adjusted index.

The year on year change for the Residential sector has seen a volume increase of 22.5%. Civil Engineering activity is also up with an increase of 3.1% year on year.

While Non-Residential activity has decreased by 0.5% since the third quarter of 2018, in the last quarter, the Non-Residential seasonally adjusted volume index has increased from 148.2 to 151.5.

Figure X - Volume of Production for all Building and construction

The number of new dwellings completed for the first half of 2018 was 7,909, which is 30% more than were built in the same period of 2017. However, this level of output is still well below the required levels. Project Ireland 2040 estimates that 550,000 homes will be required over the next 20 years, and the National Development Plan commits €11.6 billion to providing 112,000 new social homes by 2027.

The most significant domestic challenges for the construction sector remain the skills shortages, increasing tender levels and construction inflation levels, which are fuelled by increasing demand, pressure on wage rates, increases in material prices and regulatory changes.



Looking at the type of companies composing the Irish market and at their sizes, it is interesting to see the following figures for the periods from 2008-2016:

Values in n. of companies	2008	2009	2010	2011	2012	2013	2014	2015	2016
Development of building projects	2,416	3,749	3,222	3,042	2,850	2,741	2,482	2,733	2,887
Construction of residential and non-residential buildings	13,876	13,269	12,143	11,515	11,221	10,996	10,633	11,089	11,193
Construction of roads and railways	1,027	884	802	739	719	689	670	680	697
Construction of utility projects	322	316	283	270	257	268	266	276	275
Construction of other civil engineering projects	381	376	310	299	316	335	358	405	432
Demolition and site preparation	766	719	649	607	594	561	547	593	595
Electrical, plumbing and other installation activities	11,337	11,111	11,046	11,141	11,139	10,930	10,495	10,861	10,845
Building completion and finishing	22,163	18,973	17,112	16,157	16,063	15,737	15,683	17,051	17,337
Other specialised construction activities	9,617	8,075	7,040	6,486	6,371	6,245	6,215	6,858	7,307
Construction - Total	61,905	57,472	52,607	50,256	49,530	48,502	47,349	50,546	51,568

FIGURE X- CONSTRUCTION ENTERPRISES (NUMBER) BY NACE REV 2 ACTIVITY AND YEAR (SOURCE: CSO)

In terms of Employment in the construction sector, the increasing trend is forecasted to continue, after experiencing a 2.9% increase per annum for the period 2011-2016, the 2018-2019 figures indicate employment in construction is growing rapidly. The sector is expected to record a slower employment growth of 1.4% per annum in the period 2021-2030 which is approximately stable in comparison with the actual period 2016-2021²⁵.

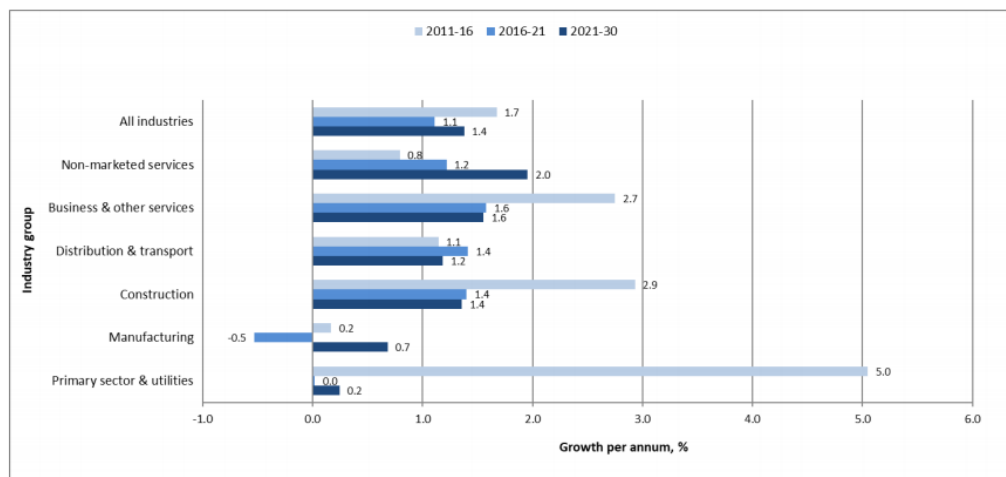


Figure X – Employment growth by broad sector of economic activity, 2011-30, 2018 Skills Forecast (Source Cedefop).

The figures provided by the Central Statistics Office CSO (2nd Quarter 2019), Labour Force Survey²⁶ confirm that the total number of workers engaged in the construction sector (NACE F- General classification of economic activities in the European Communities) is over 146,300 representing 7.4% of the workforce. This reveals an increase of 25,000 or 22% in the two years since the corresponding period in 2016. The skilled workforce represents 317,200 of the workers with women representing 11,200 of

²⁵ Cedefop; 2018 Skills Forecast 2018 - Ireland; 2019

²⁶ <https://www.cso.ie/en/releasesandpublications/er/lfs/labourforcesurveyquarter22019/>

the workforce in Q2 2019 compared to figures of 6,700 in Q2 2016 (CSO) an increase of 60% with non-nationals making up XX % of the workforce.

Of these 65% are in specialised construction activities (e.g. bricklaying, scaffolding, construction equipment renting), 28% in construction of buildings, with the remainder in civil engineering. In 2018, there were approximately 70,000 persons employed in craft occupations. The Irish construction sector is experiencing a shortage of workers, which will become even more marked as the sector grows over the next years. Indeed, the expansion of the industry is predicted to require an additional 76,000 new workers until 2020.

More than half of the jobs forecast to be created over the period up to 2030 will require a high level of qualification, while 40% of job openings are projected to require medium level qualification. On the other hand, only 6% of total job openings will require low level of qualifications, a percentage almost half of the EU-28's average²⁷.

Italy

In Italy, the construction industry is very important but its fundamental contribution to a consolidated recovery of the Italian economy has been slow after the crisis of last years.

Yet, investments in the sector significantly contribute 7,9% to the Italian GDP that is EUR 1,765,421 million (2018)²⁸, and, due to its long and complex supply chain system connecting the construction sector to over 80% of other economic sectors, its growth could allow the GDP of the country to recover half percentage point per year and align its growth to other EU Member States in the short-run.

On the other hand, and according to data from 2017, in Italy there are about 500,000 construction companies of which 1177 are large companies (more than 50 employees), 18,168 SMEs (between 10 and 49 employees) and 49,968 are micro enterprises (less than 9 employees)²⁹. These companies employ around 800,000 employees where 80% of them are older than 35 years old³⁰. In addition, from the total number of workers just 6,5% are women and 17,2% migrants.

There is also a clear dominance of employed in the sector – 61% and the remaining are self-employed.

Sector dynamics continued to be deeply uncertain also in 2018, disappointing the positive expectations formed at the start of the year.

The estimate by the National Association of Italian Constructors (ANCE) for 2018 overall construction investment suggested a timid 1.5 % increase in real terms, which is insufficient to recover the heavy losses suffered over a decade of crisis. From the beginning of the crisis, sector production levels deteriorated by almost a third, the sector has lost almost 600,000 jobs, over 120,000 companies were driven out of the construction market, and 35.1% of sector overall investments were lost since 2008. More in detail, new housebuilding declined by 66.1%, non-residential building by 27.3%, and civil engineering by 54.1%.

ANCE's outlook for 2019 is positive and envisions a 2% increase in the overall construction production levels in real terms.

²⁷ https://www.cedefop.europa.eu/files/cedefop_skills_forecast_2018_-_ireland.pdf

²⁸ Istat. Istituto Nazionale di Statistica

²⁹ Istat. Istituto Nazionale di Statistica

³⁰ 2018, Istat. Istituto Nazionale di Statistica



The expected positive trend will be driven by a continued growth in the redevelopment of the existing stock for housing purposes as well as by the first timid positive signals in private investment for residential and non-residential building.

Only housing redevelopment, which at present accounts for 37% of the overall construction activity, as compared to 19.9% in the pre-crisis years, keeps its growth pace (+20.9% Year-over-Year in 2018) also due to the stimulus effect produced by the tax relief programme providing a 55% tax rebate for the redevelopment and requalification, and a 65% tax rebate for energy efficiency works on the housing stock. ANCE affirms that investment in housebuilding has increased in 2018 (1.2% year over year in real terms), also due to a first recovery in new housebuilding investment (+3% year over year in real terms). The data from the first half of 2018 show a positive 4,7% increase, following the 11,3% increase YoY in 2017. At the same time, investments for the redevelopment of the existing housing stock continue in their positive trend (+0.5%). In 2018, private investments in non-residential building rose by a yearly 4.8% in real terms. ANCE estimated a further real term decrease of 3.2% in 2018 civil engineering investment.

Lithuania³¹

Construction sector in Lithuania is pro-cycle one, so expansion cycle is going to an end. Due to global growth worsening and likely slowdown in big neighbouring economies is going to affect Lithuanian construction companies. However real estate price still going up. However, Lithuania's economy maintains momentum, with annual real GDP- EUR 45,134 million - growth reaching 4% in the first half of 2019. Strong growth has also been fuelled by domestic demand – both investment and consumption. Recently, construction-related investment, such as construction of residential and non-residential buildings and engineering structures, has been more pronounced, which is likely to be considerably driven by the increasing use of EU funding. Over the last two years, the value added created in the construction sector accounted for approximately 16% of overall economic growth (usually this sector generates about 7% of the total value added).

The construction industry was highly impacted by the economic crisis of 2008-2009, however it started recovering and growing ever since. It increased by 55% from 2010 to 2017, from EUR 1,56 billion to 2,84 billion EUR, but still remains below 2008 figures (3,66 billion).

The labour productivity (Gross value added per actual hour worked, at current prices) in the construction sector has shown an increasing trend respectively in 2016- EUR 11,300 - 2017 – EUR 13,100.

According to the information from the Lithuanian Department of Statistics, the construction work accounted for EUR 3 billion in 2018 as compared with 2017, the volume of construction work at comparative prices increased by 13.7 %.

The construction works were carried out mostly on non-residential buildings -EUR 1,1 billion, or 36,6 per cent of the total work carried out in the country, civil engineering works were carried out for EUR 1,3 billion or 44,5 per cent of the total work carried out in the country. Compared with 2017, the volume increased by 17,5 per cent.

³¹ Statistics Lithuania <https://www.stat.gov.lt/en>

The number of employees in the construction sector reached 102,600 in 2018 and number of persons employed in the construction sector increased by 3,6% (In 2017 – 99,000 thousand). From that total amount of employees only 10,200 are female. It was 7,5 % of total employed persons in the country. (Total Employment – 1,368 million, respectively Industry Employment (incl. construction) - 348,85 thousand). There are totally 51,700 migrants employed in Lithuania 33,400 of them in industrial sector.

More than half (52,3%) of the total work carried out were the construction of the new buildings, respectively 20,1 per cent were reconstruction and 19,9 per cent renovation.

In the beginning of year 2019, 8,778 companies were operating in construction sector. It was a slight increase by 3% compared to 2018 (8511). 48 % of them specialize in the construction of buildings and their parts. Small and micro enterprises (the number of employees does not exceed 49 people) predominate in the sector.

Poland

Construction is one of the largest sectors of the Polish economy, generating between 6 and 8% of GDP and providing employment for around 6% of employees. Construction services are provided by over 584,275 entities (15,925 - SMEs) of which 96% are micro-enterprises (568,188) employing up to 9 employees. This fragmentation, sensitivity to economic fluctuations and the continuing demand for qualified employees with high competences is the most serious challenge for the development of qualifications, education and training.

The share of construction in GDP after the period of growth in 2014-18 began to decrease slightly, although the increase in construction output was still high. The crisis of 2008 had practically no impact on construction in Poland. The slowdown occurred in 2012. In the years 2014-2019 construction production increased, although its share in GDP slightly decreased.

In 2018, buildings and structures in Poland comprised the majority of fixed capital formation - buildings and structures - PLN 161,930 million (53.5%). The share of construction in Poland's GDP remained at 7.3% (analogous to 2017)

Construction is the second sector in terms of the share in the shadow economy (17%) - companies operating in the shadow economy generated 2.3% of GDP.

According to official statistics, 966,971 people worked in 2018 in the Construction Sector. There were 110,765 women within this number. Moreover, approximately 150,000 are migrant workers from 3rd countries³².

Due to the fact that construction is one of the sectors that operates almost normally from public funds, the share of construction in GDP in 2020 may increase over 8% (although construction output will be lower due to the expected slowdown in housing). Employment in the next months will be lower than in 2019 due to the departure of employees from third countries (app. 40,000 in the sector). The construction situation may be adversely affected by the financial

³² Regional statistical office in Lublin responsible for construction sector statistics www.lublin.stat.gov.pl



situation of local governments and the reduction in the number of local investments. Due to the dynamics of changes, it is currently difficult to provide reliable figures on individual indicators.

Portugal

Studies on Civil Construction are relatively recent, and there may be an increase in bibliography on this topic after 1990. The Civil Construction industry has a significant importance in the national economy as a whole and is characterised by a great diversity of clients in which each work has very different features, which makes it difficult to standardize construction processes.

The demand directed at this sector depends on the development of the economy, the economic situation and the amount of public expenditure.

In recent years, in Portugal, this sector has shown a strong dynamism motivated either by the execution of major projects, Expo 98 or the Vasco da Gama Bridge, new highways, etc. With the accession to the EEC, Portugal benefited from large structural funds to promote the development of its infrastructures, which led to a strong development of the sector, especially in the 90's.

There was a need for greater business competitiveness and there was a decrease in staff numbers, with companies starting to subcontract. More attractive salaries conditions were created to win over a diverse group of workers.

The year 2011 was marked by the beginning of an economic crisis, which had been anticipated, due to the weakening of some sectors that make up the Portuguese economy. That was the year of application for financial aid. At that time, Portugal entered a period in which the collaboration of the IMF (International Monetary Fund), ECB (European Central Bank) and EC (European Commission) was essential for a recovery that would come to fruition in 2014, with the Economy showing signs of strength and being able to face the challenges of the following years.

The Civil Construction industry, which already had some difficulties, namely in Portuguese territory, since the years 2008 and 2009, led to the internationalization of several companies, to the discovery of other markets, namely African and South America.

The worsening of the economic crisis in 2011, where public investment was low and private investment very controlled, created a very sharp outflow of labour and marked the fall of large and medium-sized companies. Those that managed to face this situation were able, from 2014, to be part of the new national paradigm.

The year 2014 marked the end of the sector's fall, the end of the crisis, having been rising until 2019. Concretely, between 2017 and 2019, the sector grew by 18% compared with the cumulative reduction of 46% in previous years

The current construction sector differs from the sector of the 90's, however there were no very radical changes. It is based on a business structure where small companies, SMEs predominate. Relevant and updated data is shown in the table below:

Construction and public works sector indicators					
Indicador	2018		2019		
	Annual value	Annual value (%)	Accumulated year-on-year change (%)		
			july	august	september
Macroeconomic indicators and financing					
	thousand M (euros)	(%)	(%)	(%)	(%)
PIB	203,9	2,40%	---	---	---
FBCF - Total	35,8	5,80%	---	---	---
FBCF - Construction	18	4,60%	---	---	---
VAB - Construction	7,3	3,10%	---	---	---
Accumulated credit to construction companies (1)	8,5	-15,00%	-16,9	-17,2	---
New credit transactions for house purchase (1)	9,8	19,10%	3,6	5,7	---

In 2018 there were 167,584 enterprises in the Construction Industry in Portugal. The number of firms in the broad construction sector decreased by 7.4% since 2010 (180,901), although the year 2014 marked the end of the sector's fall, the end of the crisis, having risen slowly until 2019 with a growth of 16.3%.

Production has remained stable since 2015 with the production of the narrow construction sub-sector and of buildings rising by 0.9% and 3.9%, while the production of civil engineering decreased by 0.9% in the same period.

These signs of recovery come after some deterioration experienced between 2010 and 2015, driven by the Portuguese sovereign debt crisis, and the impacts linked to the cuts in public spending and low levels of investment following the crisis.

The total added value at factor cost of the broad construction sector amounted to EUR 9.8 billion in 2016. The share of gross value added of the broad construction sector in the GDP reached 15.8% in 2016, in line with the 2016 EU-28 average of 16.9%.

In 2018, 530,741 people were employed in the Portuguese Construction Industry³³. While the number of people employed in the sector has dropped by 17.9% since 2010, it has continuously increased since 2014 (+16.0%). The narrow construction sub-sector employed 63.0% of the total workforce of the Construction Industry.

In Portugal, the Civil Construction and Public Works sector has a relative weight in the employment structure. From 1990 to 2000, it represents between 8% and 12% and has largely sustained the level of total employment.

The Construction sector continues to be dominated by males, although in recent years efforts have been made to counter this trend. The participation of women grew 65% between 2002 and 2012. The trend has strengthened since those years. More and more women are graduating in construction. In 2017, 419 women graduated from CENFIC and in 2018 the number increased to 540, which expanded the female class in the sector.

³³ In 2018 370,000 people employed in the narrow construction sector.

Workers are unevenly distributed according to the size of the companies. Enterprises with 0 to 9 workers correspond to 84% of the total of enterprises.

The decrease in the number of workers has been offset by the increase in the number of active companies and the use of construction workers who emigrated from their countries to Portugal (Pakistan, Afghanistan, India, Brazil, Angola, Guinea Bissau, etc.).

Civil construction is a sector with strong contrasts, low levels of qualification, strong tenacity of professions, low salaries levels and a high number of precarious employment situations.

Qualified Personnel represents only 30% of the total number of employees and Middle and Senior Management represent less than 3%.

Currently, there is a shortage of skilled workers, around 70,000 including highly qualified workers.

There is a large number of precarious workers, outsourced, with low wages. Construction professionals earn, on average, the following salaries:

- Construction Assistant - 1107 €
- Electrician - 994 €
- Architect - 908 €
- Civil Engineer - 1072 €
- Contractor - 1081 €

In addition to the above, the departure of Portuguese workers to European countries has been a reality, as they find greater economic stability.

Slovenia

Construction has been growing intensively for the third consecutive year in Slovenia meaning an important source of economic contribution to the actual GDP of the country, that is EUR 45,7 billions (2018)³⁴.

Construction enterprises in Slovenia generated turnover of almost EUR 6 billion in 2018, which is still almost 30% less than in 2008, but also 34% more than in 2013. The largest share of turnover (over 49%) was made in 2018 in specialized construction activity, followed by construction of buildings with almost 30% and in the last place by civil engineering with almost 21%. In 2017 and 2018, Slovenian construction once again experienced growth in all areas, but turnover has not yet returned to what it was in pre-crisis times. At the same time, some indicators show that the trend of growth will be reversed downwards in the near future³⁵.

Statistical Office of the Republic of Slovenia (SURSTAT) statistics for the first nine months of 2019 indicates a continuous growth in the volume of construction work performed, despite the less optimistic expectations projected at the end of last year. After 19.8% growth in construction last year, this year (2019), in the first nine months, a 6.2% growth was recorded comparing to the same period last year. The most intensive growth was recorded by CCI -construction craft and engineering works (7.2%),

³⁴ Eurostat

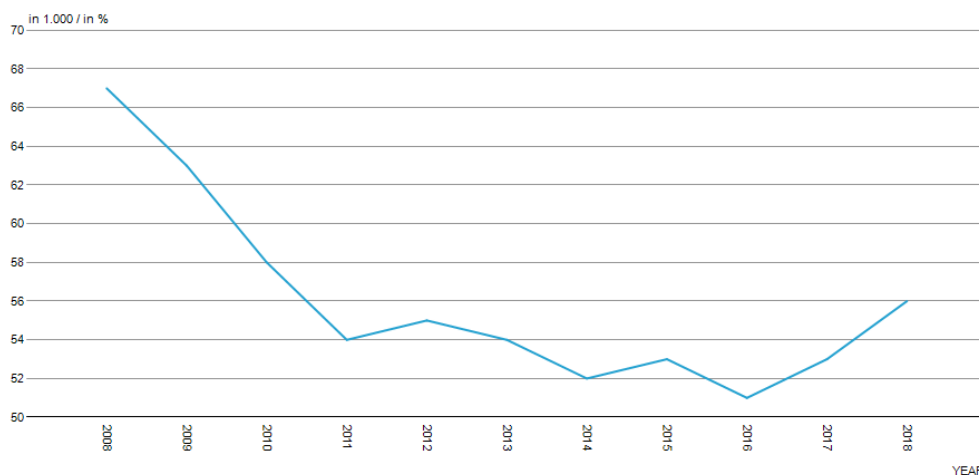
³⁵ <https://www.stat.si/StatWeb/en/News/Index/8278>

slightly smaller buildings (3.7%), where residential buildings achieved 13.4% growth and non-residential buildings increased by 0.8%.

Construction increased its net profit by 87.2% in 2018 to EUR 157 million. Six activities reported lower profit in 2018 than in 2017, while the other 13 activities increased in 2018.

Data from the 2018 Annual Reports were submitted by AJPES registering an increase in the number of employees of 4.6% in Slovenia.

Employed by YEAR. SLOVENIA, Sex - TOTAL, Construction, Number (in 1000).



Source: Statistical Office of Republic Slovenia

Approximately, 80% of construction market is performed by companies and 20 % by sole entrepreneurs.

In 2018 there were 19,220 construction companies employing a total of 60,282 employees, as was evidenced in December 2018 on the basis of on taxes paid, where 5,333 are women and 2,067 are migrants coming from MSs. In addition, 21,392, that is, 36.6% are foreigners (from third countries) were employed in Slovenia in construction. The majority of employees in 2018 were men (more than 90%). More than 39% of employees in the construction sector had completed a vocational upper secondary school, almost 33% had completed a technical or general secondary school, followed by employees with basic education (almost 13%) and only 11% of the employees had tertiary education.

The number of micro-companies (between 0 and 9 employees) is significantly superior (almost 18,000 companies) and there are only 10 large enterprises (more than 250 employees)³⁶. Since 2008 the number of companies created in construction has been declining steadily; a significant growth occurred only in 2017 with 1,535 new companies in the sector, whereas in the same period (2008–2017) the number of disappearing companies in construction has also been declining (in 2018 there were 1,562 less enterprises and in 2017 only 950 less).

³⁶https://pxweb.stat.si/SiStatDb/pxweb/sl/20_Ekonomsko/20_Ekonomsko_14_poslovni_subjekti_02_14157_SSP_03_14506_letna_razredi/14506305.px/

Persons in employment by activity (NACE Rev. 2), educational attainment and sex, Slovenia, annually

	2018														
	Educational attainment - TOTAL			Basic or less			Upper secondary			Tertiary			Unknown		
	Sex - TOTAL	Men	Women	Sex - TOTAL	Men	Women	Sex - TOTAL	Men	Women	Sex - TOTAL	Men	Women	Sex - TOTAL	Men	Women
F CONSTRUCTION	60,282	54,949	5,333	10,560	10,121	439	43,733	40,876	2,857	5,989	3,952	2,037	-	-	-
F41 Construction of buildings	13,106	11,839	1,267	2,629	2,500	129	8,910	8,308	602	1,567	1,031	536	-	-	-
F42 Civil engineering	8,086	7,318	768	1,285	1,255	30	5,583	5,233	350	1,218	830	388	-	-	-
F43 Specialized construction activities	39,090	35,792	3,298	6,646	6,366	280	29,240	27,335	1,905	3,204	2,091	1,113	-	-	-

Due to crisis and recession in period 2008-2013 approximately 34.000 jobs out of 87.947 were lost (employees left the sector, many left even country). Nowadays the unemployment rate is 5.1% in Slovenia.

Spain

Construction has been, and still is, a relevant leading sector of the social and economic modernisation of the country, contributing to its development, its territorial cohesion and the well-being of its citizens, representing in the past its production more than 18% of the national Gross Domestic Product (GDP) (currently 11.15% to the Gross Fixed Capital Formation) and employing more than 2,500,000 workers (currently 1,253,489). Therefore, we can affirm without any blush the construction is becoming the most important sector of Spain along with tourism, for its contribution to GDP and job creation, for its ability to drag with respect to other industries and for its external image.

In Spain, the value of GDP at current prices of the construction industry for the whole 2018 is EUR 129,793 million 8.4% higher than in 2017.

	2018	2017	Inter-annual variation 2018 /2017
Gross Domestic Product (million €)	1,206,878	1,166,319	3.48%
Gross Value added construction industry	70,472	64,751	8.84%
% Gross Value Added Con. / GDP	5.84%	5.55%	5.18%
Gross fixed capital formation Construction (million €)	129.793	119.758	8.38%
GFCF Construction Dwellings (million €)	67,676	61,082	10.80%
GFCF Construction other buildings and constructions (million €)	62,117	58,676	5.86%
% GFCF Construction / GDP	10.75%	10.27%	4.74%

Source: INE

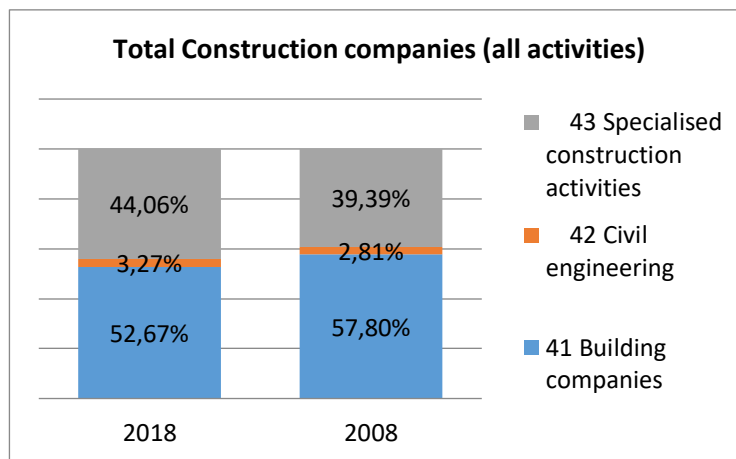
It is true that construction has also being one of the sectors most affected by the economic crisis. In recent years the construction industry in Spain has shown certain signs of progression, with significant growth but without recovering the activity rates prior to the economic crisis.

Construction activity:

	2.018	2.008
New dwellings	100.733	264.795
Renovations	28.066	34.756
Finished dwellings	64.354	615.072

Number of building permits. Source: Ministerio de Fomento

The sector presents an atomized business structure, in which 98.7% of the total companies that is, 402,923 are SMEs. Construction companies in Spain:



Source: DIRCE

In 2018, the number of employed people in the sector was 1,221,800 according to the data of the Survey of the National Institute of Statistics, growing by 8.3% with respect to the previous year.

	2018	2017	Variation
Employed	1.221,8	1.128,3	8,3%
Under 30 years old	106,1	98,8	7,4%
Between 30 -59 years old	1.046,8	962,3	8,8%
More than 60 years old	68,9	67,2	2,5%
Women (Percentage)	8,7	8,8	-0,9%
Foreigners	15,8	14,7	7,5%
Unemployment (Percentage)	9,9	11,7	-15,7%
Unemployed	134,8	150,3	-10,3%

The sector continues to age. In 2018, there was a 7.4% less workers under 30 years, which means that only 9% of workers in the sector are under 30 years. Ten years ago, the percentage of workers under 34 who worked in the sector was 42%, while in 2018 that percentage is only 19%.

Conclusions

Construction industry is a very important sector for European countries and represents a key segment in terms of GDP and employment. It was shown that all the countries participating in the project, suffered from the crisis during the years 2008-2015. However, in every country, the construction sector has experienced an increasing trend over the latest years. As an example, the countries where the sector is growing the most are Ireland and Slovenia. However, in other countries such as in Greece, the sector is advancing very slowly because of the crisis that hit the country.

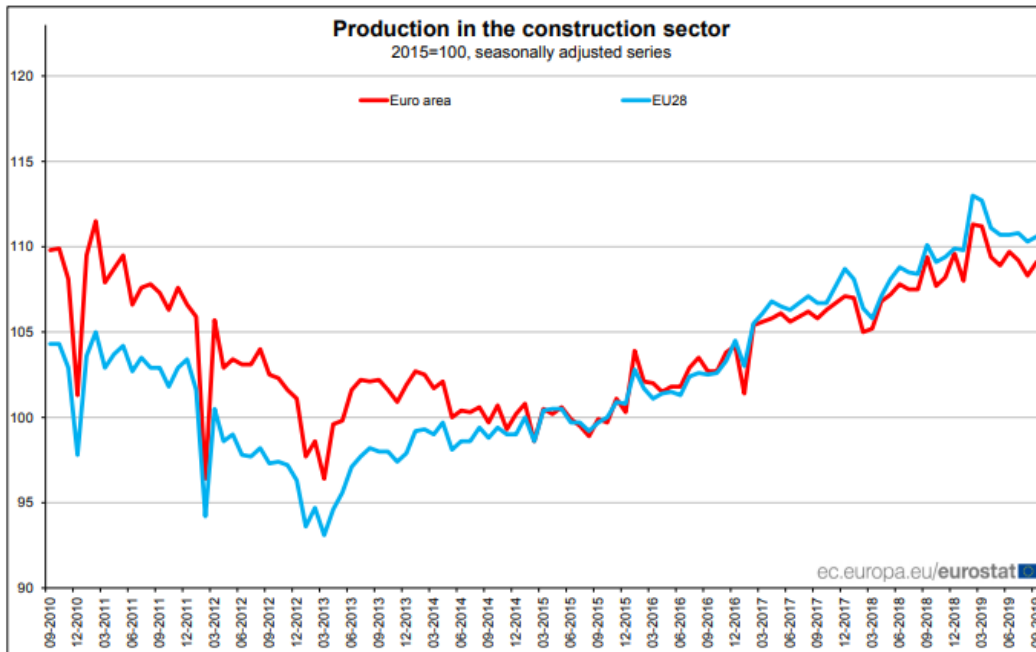
More generally and according to FIEC's key figures of the industry for 2018 main facts should be outlined³⁷:

- The main activities covered by the industry were:
 - 19.4% civil engineering activities
 - 32.1 % non-residential activities.
 - 22.7 % new housebuilding activities
- Total construction output was EUR 1,427 billion in EU, which means 43.7% of gross fixed capital formation and 9% of the total GDP.
- Construction industry employed a total of 14,818,000 people around EU.
- The number of construction enterprises totalled to 3,332,000 in EU where 95% of them have less than 20 workers.

As a more recent overview of the state-of-play of the construction industry in Europe, in September 2019 compared with August 2019, there was a seasonally adjusted production in the construction sector increased by 0.7% in the euro area (EA19) and by 0.3% in the EU28, according to first estimates from Eurostat, the statistical office of the European Union. In August 2019, production in construction decreased by 0.8% in the euro area and by 0.5% in the EU28. In September 2019 compared with September 2018, production in construction decreased by 0.7% in the euro area and increased by 0.3% in the EU28.³⁸

³⁷ <http://www.fiec.eu/en/library-619/key-figures.aspx>

³⁸ <https://ec.europa.eu/eurostat/documents/2995521/10075492/4-19112019-AP-EN.PDF/e2d4c70d-d67b-b2b6-6aa3-07a91c6a3486>



4. KEY AREAS OF INTERVENTION

4.1. DIGITALISATION

Belgium

The Confederation Construction carried out a survey addressed to its members in the perspective of its Forum Construction 2017³⁹.

According to that survey, digitization is not yet widespread; in fact, only 30% of entrepreneurs have answered that they know new digital technologies. Only 5% of companies use them and of all the companies that use these technologies, 90% believe that digitalization is inevitable. On the non-user of digital technologies side, the majority does not show any interest in it and they believe they will be able to do without these technologies. Large construction companies are the ones that seem to move faster and easily towards the digital market.

Finland

In recent years, the promotion of digitization has been one of the government's key Action Plan in the Real Estate and within the construction sector. One example of that is the implementation of the KIRA-digi aid which provides funding for new experimental projects in 2016–2018 – so far a total of EUR 3.4 million has been handed out to more than 100 experiments⁴⁰. The success of state-funded pilot projects

³⁹ Source : La construction numérique, balises pour une transition réussie - Rapport annuel 2016-2017 - Confédération Construction

⁴⁰ More information [here](#)

and the creation of a digital community in the industry are good signs. The results have estimated to generate benefits about EUR 5.5 billion a year in Finland. The project aimed to make public construction and zoning information readily accessible to everyone, develop smoothly interoperable systems and harmonized practices, and initiate a host of experimental projects to create innovations and new business.

France

Digital innovation such as BIM, simulators, augmented and virtual reality, cloud and mobile computing appear to be the keys to creating a competitive construction industry. In this context, the collection, communication and management of data are central to the digital transformation of the construction industry. However, digitalisation appears to be a great challenge for SMEs and very small enterprises, which could be overcome by:

- Convincing all actors to rely as much as possible on testimonials and feedback;
- Encouraging the development of the necessary means for vocational training and tools adapted to SMEs;
- Evolving of management methods;
- Facilitating the co-financing of hardware, software, qualification and consulting;
- Enforcing the full compatibility of all software solutions, avoiding specific, inflexible and closed systems;
- Creating networks for the dissemination of good practices across the value chain.

Greece

Adopting digital technology is currently a work in progress for the wider Greek economy, driving innovation, growth and job creation. All Information and Communication Technologies -ICT initiatives in all sectors, including the construction sector, have been included in the country's Digital National Strategy whose first priority is deploying New Generation Access (NGA) network infrastructures such as the EuroAsia Interconnector, linking the electricity systems of Israel, Cyprus and Greece, to include fiber-optic cables.

Digitalization in the construction industry is more evident at the design and feasibility phase of projects. Activities such as the construction cost control, cost planning, preliminary cost estimation and the general building system analysis are digitalized.

Germany

Work coordination and material management, transport and installation in the construction industry could be improved by digitalisation. BIM-tools and best-practise examples show how work processes can be improved. The use of technologies has not been developed yet and to promote its use some national initiatives have been organized. As an example could be mentioned the Competence Centre for Digital Crafts⁴¹ aiming at informing employers in the construction industry about the use of digital technologies, supporting them in the practical implementation of these tools in the company,

⁴¹ More information [here](#)

developing training seminars to introduce Building Information Modelling (BIM) and best practices on how working processes might be improved.

Ireland

A considerable contribution to the digitalisation of the sector in Ireland has been given by The Construction IT Alliance (CitA) that has promoted the benefits of digitalisation in the construction and engineering industry in Ireland with BIM dominating their initiatives. A survey conducted by NBS CitA⁴² in 2019 assessing Ireland's current BIM maturity stated that large construction companies have embraced BIM whereas SMEs have not adopted BIM or, if they have, they are only using the basic 2D BIM (stage 2) programmes at the design phase. This is due to the lack of interest and cost problems.

The educational institutions and some large construction companies have taken the lead in implementing BIM in their projects, in particular projects using Green Procurement Process GPP. However, the construction industry as a whole is not BIM driven and policy makers have not significantly influenced the process greatly. However, there are still conflicting opinions in the industry about BIM as to its suitability and use in Lean Construction.

Italy

BIM design is gradually and systematically gaining ground in Italy with significant developments in terms of technical regulations and legislation, which have been taken up several times, modified and updated in the last four years.

In Italy, since January 1, 2019, BIM is required for public works for an amount equal to or greater than EUR 100 million and its final application will be progressively implemented during the next 6 years becoming a prerequisite for all new public works by 2025.

The BIM Decree, in fact, has established the methods and timing for the progressive introduction by the contracting authorities, the granting administrations and the economic operators. It deals with the obligatory nature of the specific technological methods and instruments, such as BIM and infrastructures during the design, construction and management of the works and relative checks.

The obligation to use electronic modelling methods and tools begins:

- From 1 January 2019 for works with a value of EUR 100 million;
- From 2020 for complex works over EUR 50 million; since 2021 for complex works over EUR 15 million;
- From 2022 for works over €5.2 million; since 2023 for works over €1 million;
- From 2025 for all new works.

In addition, the National Industry Plan 4.0 provides some incentives to help all companies to digitalize their activities. However, some incentives are sometimes difficult to apply to the construction sector, having been designed for traditional manufacturing industry.

⁴² More information [here](#)



As far as staff training is concerned, the incentives cover both the costs of training employees and a non-repayable grant (voucher) for consultancy aimed at technological and digital transformation. Again, the standards should be "customized" to the construction sector.

Lithuania

In order to coordinate digitalization of the construction industry, the Public institution "Skaitmenine statyba" ("Digital Construction") was established in 2014. It is an organization that gathers associations of Lithuanian construction sector and coordinates the digitalization process of Lithuanian construction industry. "Digital Construction" is in the process of the creation and promotion of the unified requirements for BIM. The single construction information classification system will be continuously developed. Moreover, international data transfer formats will be introduced. Also, BIM related standards will be implemented, and public procurement specifications will be prepared. Other digital construction related activities will be coordinated and organized and businesses will be encouraged to digitize and automate various construction processes bound together by a complex relationship, thus optimizing operations.

Public institution "Digital Construction" together with Lithuanian Builders Association are creating and developing documents, such as BIM Guides, EIR (Employer's Information Requirements), BEP (BIM execution plan), BIM protocols, Building passes, BIM use stages, BIM competencies roles, etc that are available for construction markets participants.

Poland

Research conducted for many years by the Warsaw School of Economics, the Collegium of Social Sciences shows that the innovation activity of micro and small companies is very low. Both investments in new technologies and investments in employees' qualifications are very low in this segment. In construction, the reason for the low level of investment in micro and small companies is the low profit rate of companies at the end of the subcontracting chain and the instability of these businesses. The exception are small, highly specialized companies that perform installation works (including in the field of energy-saving technologies, hazardous waste disposal).

The construction industry in Poland is still a low rate innovation sector. New materials and technologies (including BIM) have been introduced, but on a relatively small scale. It is used primarily in large investments carried out by large construction companies, mainly in industrial investments, road construction and construction of office buildings. In most investments in residential construction - single-family housing, the level of innovation is low - both in technologies and in the work organization system. The exception is the increasing use of modern insulation materials - due to the increasing requirements for reducing energy consumption.

Poland is at an early stage of BIM adoption. The Polish government has recently introduced policies and instruments supporting BIM implementation in its construction industry. The BIM adoption rate is relatively low, with only 12% of construction companies using BIM in their daily work. They do so mainly for activities relating to visualization, 3D models, and to a lesser extent for collision detection and use of schedules or optimization-40. This low adoption rate is partly explained by the lack of knowledge, the absence of (systematic) BIM requirements in public procurement law, and the high cost of BIM initial

implementation. However, BIM implementation in the Polish market has a strong potential with the Polish construction market partly driven by the new construction (rather than renovation works). Other sectoral factors such as labour shortage, and external factors such as increasing price of materials and external competition, may push the Polish construction industry to implement BIM.

Digitization of the Polish construction sector may also be accelerated by a more determined inclusion of BIM in the regulation of public procurement law. Articles related to the use of BIM have been included in the new order law from 2019, but they are only recommendations. Using or not using BIM still has no formal significant impact on the choice of designer and contractor in the public procurement process, nor is it a requirement for the contracting authority.

Portugal

Portugal is considered a moderate innovative country. Innovation increased from 2011 to 2019. The country shows strong knowledge and innovation capacities in sustainable construction. There is a Government Plan to achieve an intensity of research and development by 2020. The objective is to bring together public and private organizations to generalize digital literacy, stimulate employability, professional training and digital specialization.

The use of new technologies has enabled a change in the perspective of the entire sector. Being up to date has become a requirement. Facing an era of increasingly demanding consumers, the civil construction sector in Portugal is forced to invest in new trends and innovations to ensure competitiveness and supply.

New technological advances are improving the construction industry in Portugal. Tools such as mobile apps, drones or Virtual Reality are already incorporated in the construction sector. Also, some of the latest technological trends applied to the construction sector include the increased use of prefabricated parts, the use of tools to design buildings and the use of green technology to build environmentally friendly structures.

It is then certain that technology impacts the construction industry in several areas such as productivity, safety and manpower. And to innovate, it is essential to take advantage of new working methods such as quick access to information, reduction of errors and failures, increased productivity and reduced costs.

In order to increase productivity and transform a traditional sector, the implementation of modern technology that streamlines construction operations inside and outside the workplace is highly encouraged. The use of drones is now a reality, for example, when performing an aerial scan of the work sites in order to collect important data to create 3D structural models or topographic maps that help to estimate and determine the amount of materials to reduce the excessive costs.

The use of BIM technology is also promoted to facilitate the construction process. The plans built by hand no longer make sense. A new bet appears on a more accurate model that eliminates the risk of human errors and increases the efficiency of the process. The architecture projects, structure and special installations (electricity, water and sewage, heating) that were created separately, are now brought together in one plan. A great advantage is being taken in civil construction in Portugal, through the application of this technology. There is a clear help in monitoring the state of the works and all the factors with an impact on the final results.



Nowadays the use of tablets or smartphones at the construction site is frequent, allowing an increase in productivity levels and easy access to all relevant information in real time.

Slovenia

In 2015 it was created a non-formal BIM association called SiBIM⁴³. The BIM Association Slovenia (siBIM) is a voluntary, independent and non-profit organisation that connects engineers and engineering enthusiasts, who use or would like to use BIM in the built-environment industry. Its purpose is to provide networking and training, professional development, social gatherings and exchanges of experience. The Chamber of Commerce and Industry of Slovenia -CCIS staff cooperates with SiBIM. In 2018 SiBIM prepared digitalization action plan for construction, however, even one year later political parties are unable to commit to it.

Nowadays, there is a need to digitize construction activities, increase productivity and improve the quality of works and services. It is clear that new knowledge and skills are required as well as better organization of business and procurement of public works services. In order to meet the challenges ahead CCIS established in 2018 the Construction Investment Academy, which enables students already employed to acquire advanced skills related to construction investments, communication skills, and encourage them to think creatively. This course covers 7 themes, being addressed in 7 full training days. The module no. 4, with a duration of 8 school hours, is dedicated to digitalisation in the sector and BIM.

On the other hand, large construction companies and architects have been working in the BIM environment for few years now. However, for small companies nothing has been done to trigger BIM approach with the exemption of Architectural Chamber of Slovenia (ZAPS) which in the end of the 2019 organized Group purchase of thousands of BIM software licenses for its members. Moreover, the government has issued few BIM based project tenders for construction services so far (for large infrastructure projects), to develop BIM model for public infrastructure.

With the help of EU funds European Faculty of Civil and Geodetic Engineering from Ljubljana (Slovenia) has established in year 2019 prestigious and renown study to acquire qualification Master's Degree in Building Information Modelling (BIM A+). BIM A+ is a response to the growing needs of the EU market for BIM services, which represents the future of the design and digitization of the construction process. The program will ensure relevance and exchange of good practices, as the committee will also include 25 associated partners of academic institutions and associations, design technology developers and designers and contractors from the EU, Russia and the Middle East⁴⁴.

On VET schools, BIM and digitalization pace is in general slower and pedagogic staff less prone to use (some even how to use) advanced not completely developed technology and due to not having appropriate software licences to train the students in their premises, PC classrooms.

The BIM Technical Committee also operates under the auspices of the Slovenian Institute for Standardization, which helps to prepare translations of BIM standards and to expand their use⁴⁵.

⁴³ <http://sibim.si/en/>

⁴⁴ More information <https://www.fgg.uni-lj.si/izredno-veliko-zanimanje-za-studij-bim-a-na-nasi-fakulteti/>

⁴⁵ <http://www.sist.si/standardizacija/tehnichni-odbori/seznam-tehnicnih-odborov-in-kontakti>
http://ecommerce.sist.si/catalog/tc_search.aspx?tc=769b749d-5f38-4366-99e6-c45dd79c40bb

Spain

Construction Industry is in the process of adapting to new technologies. The labour productivity is increasing and will be further enhanced once new digital technologies are widely adopted.

BIM technology offers a more effective possibility, easy to carry out and manage the different activities in a Project, however, the starting of the use of BIM is quite complex. In 2018, 55% of the companies in Spain have rolled-out a BIM project, but it has to be stressed that only 15% use BIM as a generalised method for all the projects⁴⁶. In order to be successful, companies emphasise that before starting a BIM implementation, it is necessary to generate a clear, concise and realistic integration plan, adjusted to the needs required by the organisation. It is remarkable that 37% of the companies consider that BIM is not a priority and they do not receive any pressure by the sector.

On the other hand, Initiatives such as ES.Bim⁴⁷, dependent on the Ministry of Development, which integrates all interested parties (administration, engineering, companies, universities, professionals....) are essential to promote the use of BIM in the professional and academic fields. Also, it is relevant the BuildingSMART Spanish Chapter, a non-profit association whose main aim is to foster efficiency in the sector through the use of open standards of interoperability about BIM, to reach new levels regarding cost reduction, execution time and quality increase.

Regarding the strategy to be followed to implement the use of new technologies, it has been proposed to involve all actors in the sector to promote innovation and make the sector more sustainable. Specially for SMEs in order to elaborate uniform rules for reducing complexity, it is crucial to harmonise building codes and standards at national level; to update building codes and standards regularly; to standardize and digitize construction projects, authorization and control processes and to promote R&D, for example by providing financial support for projects that promote new technologies and processes as well as improving the process of Public Procurement.

Conclusions

Although all the countries focused the digitalisation of the construction industry on BIM, it goes beyond that covering other digital technologies such as robots, automation, 3D printers and scanners and so on. A successful digitalization of the industry could be achieved by combining BIM with the other technologies already mentioned.

From the national reports it could be outlined that the EU's construction industry is not digitising at the same pace as in other industries which are adapting to the new technological challenges faster. Although efforts are being done in order to achieve EU requirement by EU Member States, through national initiatives, more stress should be put in place by national authorities when implementing their Action Plans on digitalization.

Updating worker's skills on the use of digital tools within the construction industry is also tackled by some countries, such Poland, in their reports. Effective training programmes on digitalization should be introduced in the national training systems in order to assure that worker's skills are fit-for-purpose.

⁴⁶ More information <https://www.esbim.es/observatorio/> here

⁴⁷ More information [here](#)



In addition, it was stated that for some construction companies, mainly SMEs, the use of digital tools is barely demanded. Consequently, the promotion of the use of these tools as well as their multiple cost-efficiency benefits should be encouraged.

4.2. CIRCULAR ECONOMY

Belgium

In March 2016, in Belgium, the Brussels Capital Region adopted a Regional Program for Circular Economy. It aims to turn environmental objectives into economic opportunities, to optimize resources and territorial use while creating added value locally, and to create job vacancies. Construction is one of the priority sectors identified by the Regional Plan for Circular Economy of Brussels. The needs are to enlarge the lifecycle of buildings (maintenance, monitoring, and renovation) and to use construction resources in an efficient way (notably re-using construction materials).

End 2011, the principles of sustainable materials management and circular economy were anchored in the Flemish legislation through the adoption of the Materials Decree. To facilitate the transition towards a circular economy, The Public Waste Agency of Flanders- OVAM⁴⁸ launched the Flanders' Materials Programme (FMP) in 2012. This public-private partnership streamlines the multitude of public and private initiatives in a shared and broadly supported programme with co-ownership between knowledge institutes, industry, civil society and the government

Finland

A strategic programme for promoting the circular economy is being prepared for Finland. What we aim for is a transformation into a new economy that is founded on the circular economy. By this programme, the Finnish Government wants to strengthen Finland's role as a trailblazer in the circular economy. The programme will be prepared and submitted for approval by the Government during 2020.

The programme will set the objectives and indicators, specify the measures to be taken and allocate the resources needed to promote the circular economy and achieve a systemic change.

In 2019, the Finnish Innovation Fund SITRA conducted an update of the Finnish Roadmap to a Circular Economy, supplemented by the Action Plan to a Circular Economy. The roadmap was updated in 2018. The Government of Finland and the Finnish Innovation Fund Sitra also adopted a new action plan to promote the circular economy.

France

The transition to the circular economy is recognized in France as one of the objectives of the energy and ecological transition. The aim is to produce using less material and to promote the reuse of raw materials by recovering them. In this context, waste management takes on a new dimension.

⁴⁸ <https://www.ovam.be/De-OVAM-streeft-samen-met-u-naar-een-duurzaam-afval-en-materialenbeheer-en-een-propere-bodem-in-Vlaanderen>

It also provides objectives in terms of waste management: reducing the quantity of household waste by 10% by 2025, stabilising the quantity of industrial waste, reaching 65% by 2025 for recycling so-called non-hazardous waste. Moreover, the construction sector is largely concerned by a new legislation to be adopted early 2020 on waste management and circular economy. Among other aspects, this law aims at improving construction waste collection and intensifying the use of waste tracking to avoid illegal deposits. Moreover, it will encourage the recycling and reuse of construction waste and the eco-design of construction products.

Germany

Germany implemented several legislative acts in order to support circular economy. The main framework is the Circular Economy Law which came into force in 2012 and refers to the European Waste Framework Directive. The intention of the law is to promote circular economy in order to save natural resources and to protect the environment as well as people. Overarching principle of the law is the five-step waste hierarchy:

1. prevention of waste
2. reuse of waste
3. recycling of waste
4. Other forms of waste use such as thermal use
5. disposal of waste.

Besides the Circular Economy Law, another important legislation was the Packaging Regulation, since 2019 replaced by the Packaging Law. Intention of the law is to reduce unfavourable effects of packaging waste on the environment and to increase recycling rates. One important clause of the law is the deposit obligation for single use beverage containers. It obliges the retailers to take 0.25 Euro from customers for each single use container as a deposit which is repaid when customers bring back the beverage containers. The return rate exceeds 95% and also littering has been reduced to “very low” after the implementation of the deposit scheme in 2003^[1]. However, despite these legislative efforts, the effect on the amount of waste in Germany has not been very fruitful. In fact, the amount of waste is continually increasing since 2005, with waste stemming from construction as the major driver as the following figures underline. 411,5 million tons of waste were produced in Germany in 2016, which is an increase of 2,3 % over the preceding year according to the Federal Statistical Office of Germany. 228,8 million tons of waste result from building and demolition, a share of 54 % and an increase of 3,3 % (13,8 million tons) over the preceding year. 80,7 % of all waste produced in Germany was recycled. Mineral waste forms the biggest part of waste in the construction industry. According to a press release of the Bundesverband Baustoffe –in January 2019, 90 % of all mineral waste in 2016 in Germany was recycled or disposed environmentally friendly. Therefore, construction waste was fed back into the material cycle. 95 % of mineral waste used for road building was recycled as construction material.

Greece

[1] UBA 2010: Bewertung der Verpackungsverordnung - Evaluierung der Pfandpflicht



Regarding the **circular economy** there has been adaptation of framework for construction of public and private projects by the Ministry of Energy, however, the creation of a National Road Map for the Circular Economy is still in progress in order for the legislative framework to be aligned with European directives. Circular economy aims at recycling-reuse secondary materials and waste as productive resources and useful materials, attributing a sustainable dimension to the productive model.

Moreover, the completion of Regional Planning/Plans, the utilization of RDF in the Cement Industry and Compost in agricultural production are indicative areas of the circular economy where the country has been putting a lot of focus.

Ireland

The Irish Green Building Council (IGBC) emphasizes the urgency to assess low carbon, healthy, responsible products for the construction sector. Important steps into a circular economy in construction have already been implemented by IGBC, for example through the Environmental Product Declaration project (EPD) Ireland Programme: they established the programme to allow Irish construction product manufacturers to develop and publish Environmental Product Declarations for their products. This provides specifiers with clear transparent information on the impact of the products which can be used in building level Life Cycle Assessment or embodied carbon calculations.

Italy

In Italy, it is considered essential to invest in skills and to encourage companies to take into account environmental aspects such as energy efficiency, circular economy and pollution in their production processes. Therefore, we need a plan for circular economy in construction sector because construction and demolition waste accounts for one third of the waste produced in Europe. However, recycling is difficult and expensive.

In addition, circular economy is not only a technological problem but also a regulatory one. The procedures about the waste's recycle are too complex and not clear, timing is not suitable and uncertain, and the law provides for high penalties in case of breaches. This system is a disincentive for circular economy, and it brings companies to create wastes instead of recycling them. Incentives should be given to those who reuse materials and reduce the impact of their construction site. If we want to promote the circular economy, the investment risk for companies and territories must be reduced.

Finally, it is important also to invest in the education and training of all the professionals who work in the construction sector including as one of its main objectives, the circular economy.

Lithuania

EU's Circular Economy Strategy requests Lithuania to establish the full waste management cycle. The circular (secondary) use of material in Lithuania was 4.5 % in 2016 (below the EU-28 average of 11.7 %). Recovery rate of construction and demolition waste (% of construction and demolition mineral waste recycled) is one of 10 indicators used to monitor the progress towards a circular economy. According to most recent Eurostat data in 2016 Lithuania had a very high recovery rate of 97 % (EU-28 average was 89 %). In contrast, Lithuania performs above the EU-28 average in terms of the number of people employed in the circular economy (2.71 % of total employment in 2016, EU-28 average is 1.73 %).



Lithuania supports the EU circular economy package and the shift to the circular economy in general, however, it needs to take further steps in this area. New circular economy targets on waste will be integrated into the National Waste Prevention and Management Plan for the period 2021–2027.

Poland⁴⁹

The influence of the construction sector on the condition of the economy, society and the environment is a relatively unnoticeable problem. However, official statistics say that construction uses the greatest amount of raw materials, emits the most greenhouse gases and produces the most waste among all sectors of the economy.

Poland reported a total amount of 3,510,000 tonnes of construction and demolition (C&D) waste, out of which 2,778,966 tonnes were recycled and 733,303 were backfilled. However, statistics on C&D waste may not be completely reliable due to the difficulty in tracking and reporting data to the authorities. However, the amount of C&D waste is growing due to increasing number of new construction works, especially in residential area.

Poland has no specific legal provisions dedicated to C&D waste. Instead, the Act on Waste adopted in 2012 implements the EU Waste Framework Directive as well as other EU legislation related to waste management.

Nevertheless, the Act on Waste stipulates that National Waste Management Plans have to be developed at national and regional level to meet the objectives of environmental policy. With respect to C&D waste, the current National Waste Management Plan 2014 analyses C&D waste management system, forecasts changes, as well as sets objectives for waste management and prevention. Currently all C&D waste is managed individually by Municipalities and City Councils.

Portugal

In Portugal, in 2008, the Construction and Demolition Waste Management Regime establishes the management of waste from C&D, including its prevention and reuse and its collection, transport, storage, treatment, recovery and disposal operations.

Following EU guidelines in Portugal, the Circular Economy Action Plan (PAEC) was approved in December 2017 by a Resolution of the Council of Ministers, which identifies some priority areas and sectors to encourage projects in circular economy. This Plan appears, taking into account the unsustainability of the use of natural resources, where Civil Construction is located, one of the sectors that most consumes the raw materials and, at the same time, the most produces waste (RCD) from construction and demolition, representing the largest waste stream in the EU.

Following the PAEC, the Construction and Demolition Waste Management Protocol is created with specific guidelines for the RCD. This protocol reinforces confidence in the C&D waste management

⁴⁹ European Construction Observatory - Country Report Poland (December 2019) p.20

process, introducing improvements in the collection, transport and treatment processes of produced waste, as well as the quality of recycled materials.

Thus, there is an incentive to pilot projects within the scope of the circular economy, which have to consider the improvements contained in the Protocol.

Slovenia

Circular economy has been predominant and an important topic in Slovenian economy. Innovations were boosted by following circular economy. Over the years, many European projects led by key sectoral employers' stakeholders (GZS - Slovenian Chamber of Commerce, ZAG - Slovenian National Building and Civil Engineering Institute, GI ZRMK - Building and Civil Engineering Institute, OZS Chamber of Craft and Small Business of Slovenia...) are focused on developing new business models, introducing the concept of circular economy and creating an added value for the construction sector. Although construction raw materials are nowadays still much cheaper and broadly available, problems arise when recycling them. Moreover, using more these materials cannot be expected in short-term so external triggers or mandatory rules are needed to change this perception.

Basically, circular economy in the construction industry is based on pilot projects that inform, raise awareness and present possible business opportunities. Transformation of the national economy towards circular economy concept is very much related also to a change in mind-set. For many years, sustainability has been perceived as a cost-increase, rather than a value enhancement. Beyond the construction phase, building maintenance, management and decommissioning are vital in incorporating circular principles. New construction materials from recycling have been produced and if compared with traditional construction products they should bring advantages and a better performance.

Spain

The transition to the circular economy is recognized in Spain as one of the main objectives of the Ministry for Ecological Transition, being construction one of the priority sectors to implement it. On this regard, the National Plan for Waste Management (PEMAR) 2016-2022 introduces objectives and guidelines to improve the quality of recycled materials and to encourage the use of these materials.

In addition, in September 2017 the Ministries of Environment and Economy and the main business associations signed an agreement to promote the circular economy and a draft of National Strategy for Circular Economy has been presented.

Circular economy requires continuous learning, flexibility in the approaches, analysis and measurement of results and collaboration.

It is important to act in the education and training of all the professionals who participate in the construction sector with the principles of the circular economy. To this extent, it is considered necessary to influence the different training programs to include this type of criteria, principles and concepts and also the need to organize specialized recycling courses adapted to each professional.

Conclusions

In every country under analysis, circular economy is considered as one of the main drivers that should lead the national action plans designed for the construction industry. National initiatives have been taken in order to tackle the issue at national level although reliable data is not always available in the countries in terms of production of wastes.

In some countries, there are de facto evidences of the right steps already taken. For instance, in Germany, they have the Circular Economy Law mainly focused on the management of wastes from the beginning of the process until the end. Such management is also contemplated in other national initiatives achieving a high rate of recycling of construction materials as for example in Lithuania and Spain.

Nevertheless, there is a common acknowledge of lack of specific skills on circular economy within the construction sector. Training on the performance of management of waste should be introduced in the national training systems as well as specific information on the impact of construction products on the environment.

4.3. ENERGY EFFICIENCY

Belgium

In Belgium, the average energy consumption of residential buildings decreased by around 2% per year between 2002 and 2015 thanks to measures taken to improve energy efficiency of buildings and in particular insulation.

Overall, consumptions of gas, oil, coal and heat have decreased between 2002 and 2015. However, there is also an increase in the consumption of electricity from 1.58Mto to 1.62Mtoe for residential buildings. The main reason for this increase is the more intensive use of electricity-consuming appliances, such as IT devices.

The increase of the overall consumption of energy which is a consequence of the growing number of dwellings is more than offset by the decrease of average energy consumptions of residential buildings achieved thanks to financial incentives but also awareness-raising campaigns.

Finland

Finland has a long tradition in building regulations and guidelines that comply with sustainable development. The control of these regulations provides guidance in energy-efficient construction. Management of energy use in buildings reduces electricity, heat and water consumption and related cost and environmental impacts. Efficiency in energy use can be increased in connection with building construction, use and improvements. Nevertheless, energy must not be saved in buildings at the expense of indoor air quality, which must be taken in account in sustainable construction and rational use of energy.

In Finland the energy efficiency agreements in the property and construction sector has gained results in the improvement of energy efficiency. The agreement covers a significant part of the private service sector and state-owned buildings. The improvement of energy efficiency plays a key role in the practical



implementation of companies environmental and social responsibility. In Finnish housing energy consumption has decreased by 7,7 % from the 2010 level compared to the 2018 level.

The Housing Estate and Constructor Association ASRA has an energy efficiency agreement for non-profit and municipal housing properties. The agreement aims to reduce specific energy consumption and bring into practice everyday energy efficiency models for companies and communities.

The energy consumption of the building stock will be reduced by the current total by 13 years between 2015 and 2050, with the existing stock increasing by 38. This mainly comes from the old building stock, from more energy efficient new production, from renovations to old buildings and from changes in heating methods.

France

In France, the “Thermic regulation” (RT) covers the standards on energy consumption of new buildings and renovation works. The next Environment Regulation- RE 2020 - will also cover the carbon emissions of buildings.

Since 2016, compliance with energy efficiency standards has been a condition to benefit from public support for energy renovation projects. Households wishing to proceed with an energy refurbishment and have access for example to zero rate loan, tax credit etc. have to use “Recognized environmental Guarantor” (RGE) certified companies for these works.

Moreover, since 2017, the Energy Transition Act legally framed the decentralized energy production, i.e. the electricity production from private individuals and its purchase to certified companies. The Agency for Environment and Energy Management (ADEME) published in 2017 a guide to promote decentralized energy production through citizen-based renewable energy projects. It contains:

- A presentation of the current legislation.
- Specific and concrete action levers for local authorities.
- Opportunities for local associations and citizens’ groups to engage their local communities.
- Testimonies that present difficulties, oppositions and solutions.

Germany

The provision of space and water heating take up 1/3 of the total energy consumption in Germany. The production and efficiency of building materials as well as energy-focused building refurbishment could be improved with regard to environmental protection and the conservation of resources, according to the Federal Environment Agency. The German government published a guideline about sustainable construction which is binding for federal buildings considering ecological, economic, sociocultural and technical aspects and should serve as an example for companies in the construction industry. Moreover, the government promotes energy consultancy. Training centres and chambers of crafts organize courses about energy efficiency and energy-saving advice for professionals in the construction industry.

Greece



In terms of energy efficiency, the EPBD Directive for improving the energy efficiency of the European building stock has been enacted by the national law N.3661/2008. The “Regulation on the Energy Performance of Buildings – KENAK” outlines the general calculation approach that is in accordance to European standards. There are governmental policies that are trying to move towards environmentally friendly policies, however, due to the economic crisis, the rejuvenation of the building stock is still in slow progress. Along the main long-term goals in the country (2030) is the creation and promotion of Manuals for improving energy efficiency in procedures of production.

In Greece, the Construction and Demolition sector is considered to be a critical priority area and the country will take a series of measures to ensure the recovery of valuable resources and the proper management of waste from building and demolition buildings, in order to facilitate the assessment of the environmental performance of buildings. Moreover, given the long lifetime of buildings, it is necessary to encourage design improvements that will reduce the environmental impact and increase the durability and recyclability of their components. Also, the methods of exploitation should aim to minimize environmental nuisance and recycle.

Ireland

The Climate Action Plan was published in 2019, with significant outputs regarding energy efficiency and life cycle certifications. 54% of Irish organisations participating in the World Green Building Trends 2018 SmartMarket Report expect their projects to be green by 2021⁵⁰. The number of green buildings has increased significantly in Ireland over the last 5 years thanks to the substantial social and economic impacts of going green. In spite of these encouraging results, the lack of educated green building professionals was identified as a key obstacle to more green building by nearly half of Irish participants.

The newest emerging occupations are within the NZEB areas due to the adoption of the NZEB definition early in 2017 and the requirement that all buildings types must by law be compliant to NZEB standard as of November 2019 with a number of courses to train consultants and tradespeople in NZEB construction underway at HEI and VET levels. These include: NZEB professional consultant, NZEB professional design consultant, NZEB craftworkers (plasterers, carpenters, electricians, plumbers, bricklayers), NZEB for ventilation installers, NZEB for Site Supervisors/Foremen, NZEB for construction workers, Environmental Certificate for Professionals.

Italy

In Italy, as in other countries, European directives have been transposed. In particular, this happened with the legislative decree no. 102/2014, which implemented Directive 2012/27/EU on energy efficiency, provided for measures to improve the energy efficiency of public buildings, the establishment of the National Energy Efficiency Fund and a new regulation of derogations regarding the thickness of the envelope and minimum distances of buildings, and with law decree no. 63/2013 which transposed Directive 2010/31/EU on energy performance in buildings. In addition, the 2014 energy efficiency action plan for improving the energy performance of public and private buildings through three instruments:

1. The strategy for the energy upgrading of the property stock;

⁵⁰ W. Green Building; World Green Building Trends 2018 - Smart market report; 2018.



2. The national action plan for buildings with almost zero energy: since 2021 the new buildings will have to be almost 0 energy;
3. The plan for the energy requalification of central public administrations.

As regards the promotion of renewable energy sources, Italy has the goal of reaching in 2020 a share of 17% of energy from renewables in gross final consumption and 10% for transport. In addition, minimum environmental criteria have been established. The main financial instruments, mainly relating to buildings in the residential and tertiary sectors, are follows:

- Eco-bonus, i.e. 65% tax deduction for energy efficiency expenditure in the residential and commercial sectors;
- The thermal account 2.0, which consists of incentives for small energy efficiency measures and for the production of thermal energy from renewable sources.
- the Central Public Administration Energy Rehabilitation Program, PREPAC, relating to the energy requalification of buildings used by the Central Public Administration.
- the former Kyoto Fund, under which €350 million has been allocated to support the improvement of energy efficiency in school and university buildings;
- The National Energy Efficiency Fund established by Legislative Decree No. 102/2014, which was funded by about 70 million euros per year for the 2014-2020 period but is not yet operational.
- the Structural Funds, under which 1.5 billion euros have been allocated for improvements in the energy efficiency of buildings occupied by local public administrations.

Lithuania

The efficient use of energy resources and energy is one of Lithuania's key long-term strategic objectives in the energy sector. One of the objectives set in The National Energy Independence Strategy approved in 2018 is Energy efficiency improvement. In 2010-2015, the energy intensity of the country's economy consistently decreased (primary energy – 32%, final energy – 31%), and in 2015 was the smallest among the three Baltic States at 205 kgoe/1000 EUR (in Latvia – 207 kgoe/1000 EUR, Estonia – 358 kgoe/1000 EUR). Lithuania is still behind (by about 70%) the EU average (120 kgoe/1000 EUR).

The greatest potential for energy efficiency improvements based on the economic feasibility of effectiveness measures is in the industrial, building and transport sectors. The construction sector's contribution to energy efficiency is very high. The energy efficiency in the construction sector is influenced by the implementation of the regulations of Directive 2010/31/EU of 19 May 2010 on the energy performance of buildings.

Lithuania, in implementing the provisions of the Directive on the energy performance of buildings from 2018 made obligatory all new buildings to be A+ class, and from 2019 all new public buildings must be A++ nearly zero-energy buildings.

Poland

Over last years, Poland has made significant improvements in energy efficiency, a topic which benefits from a strong governmental commitment. As a result, energy efficiency has improved in the main industry sectors in recent years, and Poland managed to reduce their energy intensity faster than the



EU-28 average between 2005 and 2015. However, only 2.8% of the EFSI funding, some EUR 2.2bn, is dedicated to energy efficiency in buildings.

The main national strategy documents on energy efficiency in Poland are the Energy Policy of Poland until 2030 (EPP 2030) and the 2017 Fourth National Energy Efficiency Action Plan (NEEAP).

These policies are supported by legal acts, like the Law on support to thermal upgrade and refurbishment. Moreover, many Polish legal acts relevant to resource efficiency and sustainable construction are EU-driven, such as the Bill amending the Energy Efficiency Law (Ustawa efektywności energetycznej), which implements the Energy Efficiency Directive (2012/27/EU) and the Law on Energy Performance of Buildings, which transposes the Energy Performance of Buildings Directive (EPBD, directive 2010/31/UE).

In addition to the legal framework, energy efficiency in buildings is supported by a significant number of instruments and measures. The following are some of the main schemes implemented to achieve better energy efficiency. For instance, the Thermal Upgrade and Refurbishment Fund (Fundusz Termomodernizacji i Remontów) awards premiums helping pay back up to 20% of the loan for thermal upgrade or refurbishment of residential buildings. In the period 1999-2014, the Fund managed about EUR 450 million and helped save approximately EUR 190 million on energy costs. This program is undoubtedly the most recognizable and the most widespread tool for improving the energy efficiency of buildings among private consumers.

The Operational Programme Infrastructure and the Environment 2014-2020 (Supporting energy efficiency, intelligent energy management and the use of renewable energy sources in public infrastructure, including public buildings and housing) provides grants and soft loans for energy efficient refurbishment of multiple family housing, including use of renewables. The programme has an implementation period of 2014-2023. Funding under the programme requires the preparation of energy audits, thus ensuring to verify energy savings. In terms of budget, the programme allocates EUR 205.5 million to public buildings and EUR 225.6 million to residential buildings.

The number of certified green buildings in Poland has increased over the years. A voluntary building certification program has also been developing in the last years. According to Polish Green Building Council (PLGBC), during March 2018-2019, there were 648 certified buildings in Poland, an increase of 29% over the same period of previous year. Out of 648 buildings, around 74% were certified with BREEAM, 23% with LEED, 2% with DGNB, 1% with WELL, and 0.8% with HQE. Around 51% of total 1,268 certified facilities of Central and Eastern Europe are located in Poland. It should be emphasized, however, that many buildings that meet the certification standards do not have them, because the owners see no need to incur additional costs⁵¹.

Portugal

In Portugal, the buildings built after 1990, only one third meet the requirements for energy efficiency, with Portugal being one of the EU countries where the greatest thermal discomfort is experienced. The National Energy and Climate Plan (PNEC) has improvement objectives, with regard to the energy

⁵¹ <https://www.gov.pl/web/klimat/efektywnosc-energetyczna>



efficiency of buildings, to be implemented by 2030. Among the objectives of this Plan is a 35% reduction in primary energy consumption, but for that it has equipped buildings with greater energy efficiency.

Of the incentives created, the “casaeficiente2020” programme stands out, which supports, in its own or common spaces, interventions such as replacement of windows and roofs, thermal insulation, installation of solar panels, as well as more profound reforms. The Energy Efficiency Fund (FEE) was also created in 2017, to finance the costs of insulation and roofing interventions in buildings prior to 1990.

In a common objective of Brussels and Portugal, the Recovery and Resilience Plan (PRR) - Recovering Portugal 2021-2026 appears in a preliminary version, with a view to making Portuguese buildings more efficient. This Plan also includes a long-term renovation and recovery strategy for buildings in Portugal, also because many of the existing buildings remain in great energy poverty.

Slovenia

In 2015, the Government of the Republic of Slovenia adopted an Action Plan for Near-Zero-Energy Buildings for period from 2015 until 2020. The Energy Act defined the requirement that "all new buildings must be near zero-energy". The above provisions of the Energy Act constitute the transposition of the almost zero-energy building requirements of Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings. The National Action Plan is also linked to the "Long-Term Strategy for Promoting Investment in the Renovation of the National Fund for Public and Private Residential and Commercial Buildings" (Long-Term Investment Promotion Strategy for ENERGY BUILDING), adopted in October 2015. The starting points for the strategy are set out in two national strategic documents, namely the GHG 2020 Operational Program and the 2014-2020 Operational Program for Implementing European Cohesion Policy.

Energy efficiency in building is especially boosted by national ECOFUND and its calls for companies and entrepreneurs to start installing more energy efficiency construction products and building systems (CMS etc...).

In 2019 a consortium of institutions prepared a draft of the Comprehensive National Energy and Climate Plan (NEPN) for Slovenia to set national contributions, targets, policies and actions through the five dimensions of the Energy Union by 2030 with a view to 2040, namely carbonization, energy efficiency, energy security, the internal energy market and research, innovation and competitiveness.

Spain

Spain has implemented the directive 2018/844/EU which aims to accelerate the cost-effective renovation of existing buildings and, more specifically, introduces building automation and control systems as an alternative to physical inspections, encourages the deployment of the necessary infrastructure for e-mobility, and introduces an intelligence indicator to assess the technological aspects of the building.

With regards to nearly zero energy buildings (nZEB), there is also applicable regulations which are already being amended to adapt them to the new directives:



1. Draft Royal Decree amending Royal Decree 314/2006, of 17 March, approving the Technical Building Code.
2. Modification of the Royal Decree amending Royal Decree 1027/2007, of 20 July, approving the Regulation on Thermal Installations in Buildings (RITE).
3. Modification of Royal Decree 235/2013, approving the basic procedure for the certification of the energy efficiency of buildings.

In addition, the Integrated National Energy and Climate Plan⁵² defines what Spain must do until 2030 to achieve the energy efficiency (32.5%) and Renewable Energy (40%) targets in line with the European Union's commitments.

Conclusions

Energy efficiency is other new skills driver of the construction industry. Many European initiatives are being developed stressing the need of continue education and training on energy efficiency and renewable energy in buildings.

All partner countries have implemented European energy efficiency regulations: Directive 2010/31 / EU and 2018/844 / EU. Moreover, all have issued laws and regulations in their respective countries.

In all partner countries courses are being organized and carried out for consultants, technicians and workers in the construction of nZEB and energy efficiency, but all have identified a lack of professionals, consultants and workers qualified on this topic.

⁵² https://ec.europa.eu/energy/sites/ener/files/documents/spain_draftnecp.pdf



5. SKILLS GAPS AND TRAINING NEEDS

Belgium

Belgium experiences labour shortage of about 20,000 construction workers every year. This, coupled with the significant skills gap and uneven reforms in construction professions, has affected the growth of the Construction sector in the country

The greatest challenges that the sector is facing are finding qualified workers and appropriate skills. The highest scarcity relates to recruiting trained technical personnel with a highly technical degree, engineers, project managers, and mathematicians. In addition, the construction sector needs plasterers, painters, plumbers, bricklayers, carpenters, scaffolders, roofers, tile layers, building site workers, electricians and mechanics. Thus, in order to counteract the number of workers leaving the profession, the number of new recruitments will need to increase from a baseline of 24,150 in 2012 to 24,900 in 2030. This number may be as high as 32,000 if the workforce increases by 1%, whereas it could decrease to 19,000 in case the workforce is to decrease by 1%⁵³.

The Belgian vocational education and training (VET) system enjoys above average participation rates. The employment rate of VET graduates reached 76.7% in 2018, lower than that of 78.0% in 2017, and slightly below the EU average of 79.5%.

However, only a small fraction of the VET courses also covers work-based learning, with the corresponding figure of 6% in 2018, as compared to the EU average of 27%. Indeed, the regional governments are taking action to counteract this development.

A study carried on by the Belgian foundation for vocational training in the construction industry, the Belgian Building Research Institute and Regional Energy Agency estimated that 33400 workers will need training on energy efficiency and Renewable Energy sources in the construction sector for 2020. The study also highlighted the slow rate in which trainings are adapted to technical evolutions in the construction industry. A stronger link between industry and training providers could help remedying this pitfall.

To face the lack of skilled workers, the social partners of the construction sectors have agreed upon a bonus system for students following construction related trainings. In 2019, students in their first year of training will get a bonus of 200€. This bonus will rise to 300€ in their second year of training. This means that students following the complete construction training can get up to 1500€ bonuses.

On the other side, construction companies investing in the training of their workers can also receive financial incentives.

The Belgian construction sector has taken initiatives to enhance construction skills. The focus will be notably placed on-the-job education. Belgium are planning to alter the professional qualification requirements for a list of 27 regulated 'artisanal' professions. Flanders region, for example, lifted the professional qualification requirements from all of these 27 professions in 2018, 11 of which belonged to the construction sector. Wallonia has abolished the qualification requirements for five of these

⁵³European Commission, Country Report Belgium February 2019.

https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-belgium_en.pdf

professions from December 2018. However, in the Brussels-Capital Region preference will be given to a certification, followed by validation tests for skills, or vocational training⁵⁴.

In addition to attracting young people, specific action has been taken to target women and attract them to the construction sector. The portal 'Femmes de metier' is dedicated to the recruitment of women, who are interested in a career in the construction sector. The portal offers information on specific trainings and includes testimonials of women working in construction.

Finland

The Finnish construction sector faces serious issues in terms of skill and workers shortage. According to the Confederation of Finnish Construction Industries, there is a mismatch between labour supply and demand in the Finnish construction sector. In Finland, professions such as civil engineers, concrete placers and finishers, and other construction workers are in high demand ⁵⁵.

Moreover, given the increasingly tighter energy efficiency, and considering Finland's ambition to keep its position as a global leader in sustainable construction, more skilled workers in heat insulation and air tightness, moisture control, RES (renewable energy systems) installations and HPAC (heating, plumbing and Air conditioning) will be needed.

In addition to skills shortage, construction companies are also facing shortage of labour. This issue is further exacerbated by the fact that the unemployed workforce, which could constitute a resource for the sector, is not located where the bulk of the construction activity is concentrated, i.e. in urban areas. To address this issue, foreign labour increasingly participates in the construction activities ⁵⁶

Renovation work requires good basic skills like knowledge of construction methods, use of different materials, problem-solving skills and general multi-skilling. Key skills required for demolition work are sorting of materials, further processing of parts and general level understanding on so called resource wisdom.

For wood construction and CLT technology related expertise has emerged new demands.

Increasing digitization requires training for both new construction students and those already working in the field. This is also linked to the intelligent home know-how, which would be good for construction professionals to have at least basic knowledge. Especially in the field of HVAC - Heating & Air Conditioning the amount and content of the training must be taken into account as there is a clear increase in digitization.

The fluent use of professional technical equipment and applications requires both good basic skills and application-specific training.

⁵⁴ National Reform Programme 2019, April 2019 https://ec.europa.eu/info/sites/info/files/2019-european-semester-national-reform-programme-belgium_en.pdf

⁵⁵ Occupational barometer: labour shortage in 54 occupations, March 2019, <https://www.foreigner.fi/articulo/work-and-study/occupational-barometer-labour-shortage-in-many-occupations/20190328103708001595.html>

⁵⁶ European Construction Sector Observatory, country report Finland, November 2019 p.19-20

Training in the use of special professional tools is justified in basic vocational training when the use of this technology is sufficiently general, and the skills are widely used in the profession. Schools can play a certain role in the training of special techniques and applications but because the field of needed skills is so fragmented, training is planned on a case-by-case basis.

France

On a cyclical basis, the construction industry has experienced workforce shortages, depending on the economic activity cycles. Therefore, it is important to better anticipate labour market needs. Moreover, some actions should be undertaken in order to improve the image of the construction industry to attract new people and develop an adapted training offer, such as:

- Make training systems more flexible: design skills development paths accessible at any time, by any person at any level, considering transferable experience in the building or other sector (logic of competences to be built up rather than training paths to be conceived).
- Develop training actions more correlated with economic activity.
- Justify training costs in terms of measurable investment.

Besides, VET providers should pay attention of current lacks in worker qualifications regarding digital talents that prevent them from the adoption of digital tools and digital processes, as well as from any kind of collaboration with other workers, suppliers and subcontractors acting on the same worksite, in concrete work situations where digital means are used.

Regarding skills needs, appropriate online platforms accessible to any profile of workers could be developed and contribute to a systematic updating of skills and knowledge, necessary to follow the changes. Digital skills would be essential to decompartmentalise crafts and elaborate long-term development strategies including even more energy audit, circular economy or specific industrial programs for any kind of professionals. A database of skills required for the energy transition has also been developed in France.

To sum-up, the French construction sector faces risks linked to the shortage of workers with digital and energy efficiency related skills. According to estimates, France needs to train up to 80,000 workers in Building Information Modelling (BIM) by 2020, i.e. about 27,000 per year. According to a recent study from the National Institute of Statistics and Economic Studies (INSEE), 50% of companies in the construction sector cite skills mismatch as a barrier to hiring.

According to the FFB, labour and skills shortages, if not addressed, may very well impede the development of the sector in the coming years. To help addressing it, the FFB has developed two types of initiatives to address this issue:

- National and local awareness-raising campaigns to attract youth, women and unemployed people in the construction sector. In 2019, the FFB contributed to attracting 15,000 workers in the sector, following their programme “15 000 Bâtisseurs” (“15 000 Builders”).

- Creation of a national platform on construction employment, whereby companies can post job offers and people can apply to them⁵⁷.

Germany

Demographic changes constitute a particular threat for the German construction sector, creating difficulties in filling up the increasing number of vacancies originating from the growing proportion of retiring construction workers. In 2016, 10,784 new construction apprenticeship contracts were signed, compared to the 13,500 workers that retired in the same year. The ratio of apprentices to skilled workers was 8.7 in 2014, below the critical value of 10, evidencing an unmet demand for skilled workers, particularly in enterprises with fewer than 100 employees.

With increasing demand for construction works, the industry is confronted with labour and skills shortage. As of 2018, there were around 1.2 million unfulfilled positions in Germany, with around 250,000 positions open for crafts sectors, like construction. There has been specific shortage of professions such as electricians, plumbers, plasterers, sanitation workers, heating and ventilation technicians, and the like.

The construction sector is among a number of sectors in Germany which are affected by the lack of qualified personnel.

In 2018, 79.0% of companies in construction assessed skills shortage as the biggest risk for their businesses. This compares to 21.0% in 2010. Additionally, in 2019, 85% of construction firms and 86% of infrastructure firms, quoted lack of availability of skilled staff as a major long-term constraint to their investment and development activities.

Migration mitigates to some extent the labour shortage, with every sixth worker in the broad construction sector being a foreigner in Germany.

However, more facilitated access to the labour market is needed to meet demand and fill vacancies. New legislative changes to the immigration law are tackling barriers to the labour market to ease the situation⁵⁸.

In order to identify skill gaps and training needs in the construction industry, various projects at European and national level were developed. The research results of these studies made clear that qualifications appear necessary in the following areas:

- digitalisation
- energy efficiency
- occupational health and safety
- Green Skills

⁵⁷ European construction Sector Observatory, country report France, January 2020 p.17

⁵⁸ European Construction Sector Observatory, country report Germany, January 2020 p.17



In addition, it was emphasised that there is a "mismatch" between occupations and personal qualification, so that data analysis programmes are developed, as in the example of Detecta⁵⁹, in order to balance supply and demand throughout Europe. With regard to the databases, Build up Skills (BUS)⁶⁰ also pointed out that a database related to the construction industry is still missing.

In particular:

- In the SkillCo project⁶¹, the skill gaps in the four areas will be addressed at EQF level 4.
- In the BUS project, the trainers were further qualified with regard to energy efficiency at all EQF levels.
- In the Detecta project, all EQF levels related to hard and soft skills.

There is also a need for a database system for the construction industry to compile these different qualification levels and contents.

Greece

Greece has one of the highest skills mismatches in the EU. In 2016, 43.3% of its tertiary graduates were working in jobs that did not required higher education qualification against the EU-28 average of 26.0% ⁶².

The biggest problem of the construction workforce in Greece is the low levels of training participation and adult participation in lifelong learning caused by the lack of incentives for participation in training activities. Another concern relates to the age structure of the workforce, as most of the current older workforce does not express strong interest in vocational training and new technologies⁶³.

The employment of low-skilled persons is expected to decline (from 32% to 21%), while demand rises for jobs with medium (from 41% to 45%) and higher qualifications (from 27% to 34%). Shrinking is anticipated mainly in the primary and secondary sectors, while services appear to be rising by 2025. Two thirds of building and related trades workers held medium level qualifications in 2015, a trend that is expected to hold by 2025. During the same period the share of highly qualified workers in this occupational group is expected to grow, on the expense of low qualification holders.

The growing need for higher level skills can be attributed to a number of key drivers:

- Technological advances bring about a number of emerging new practices, which are likely to change the landscape of the construction sector. Workers in building and related trades must possess sufficient qualifications and take up professional development opportunities to use new IT-based, or automated, equipment, such as remote-controlled vehicles and smart tools. One

⁵⁹ <http://www.e-detecta.eu/web/>

⁶⁰ <https://www.buildup.eu/en/skills>

⁶¹ <https://www.skillco.eu/content/news/>

⁶² Education and Training Monitor 2018 - Greece.

https://ec.europa.eu/education/sites/education/files/document-library-docs/et-monitor-report-2018-greece_en.pdf

⁶³ European Construction Sector Observatory, country report Greece, November 2019 p.20

key IT –based technology that is expanding its influence throughout the industry is Building Information Modelling (BIM).

- Use and combination of materials in building construction is also evolving along with innovation in the sector, consequently, this increases the demand for specific skills.
- As projects grow in size, off-site manufacturing becomes more important, many parts of a structure can now be built in construction factories before being transported. This means that there's less need for tradespeople like bricklayers and plasterers on-site, and that they will need to adapt their ways of working to factory situations with new qualifications.
- Technical skills are also very important in off-site building and construction roles, such as computer aided design or computer aided manufacturing.
- Climate change challenges the need for greater energy efficiency. Therefore, the development of “green” buildings and sustainable waste management has emerged. Current and future workers will need to have relevant skills to work with new and “green” material and techniques.
- The energy sector will also be a major driver of demand for specific skill sets of construction workers. With its aging energy infrastructure in Greece will need major investments to build, retrofit or decommission its power plants. Construction workers' skills will be of major importance as most power plants have been build decades ago, know-how related to steel-fixing or building of large concrete structures that require specific endurance and durability are often not easy to find.

Ireland

Skills shortages are one of the biggest challenges for the sector's growth. Lack of qualified professionals is present from the trades to the engineering and design studies.

According to the Demand for Skills in Construction to 2020 report published by the CIF/DKM Economic Consultants in 2016 highlighted the need to increase the number of skilled construction workers to ensure the industry had the ability to meet future demand. Some key findings from the survey included in the Demand for Skills in Construction to 2020 report are listed below:

- Inadequate supply of qualified tradespeople.
- Skills gaps have emerged across the full range of construction trades and are most pronounced in the “wet” trades (e.g. Plastering). The shortage is so severe that there exists the potential for long term problems, such as is the case of Floor and Wall Tiling, where no new apprentices have registered in the last number of years.
- Lack of available candidates for apprenticeship. Although a drive to alleviate this shows promise in 2019.

In terms of uptake, the current level of apprenticeship intake, particularly in wet trades (bricklayers, plasterers, painters and decorators, floor and wall tilers), is very low (double digits). As it takes four years



for an apprentice to fully qualify, the training output is likely to lag behind the demand arising from the anticipated strong growth in residential development. This may lead to shortages in the medium term.

The Further Education and Training Authority, SOLAS is currently reviewing a number of apprenticeships to include NZEB and life cycle trainings. A number of NZEB programmes have been adopted by the educational training boards to upskill existing craftworkers and it is envisaged that these will be included in the next adaptations of the apprenticeships i.e. the Joinery apprenticeship is currently being reviewed to include NZEB requirements.

The expansion of the sector is predicted to require an additional 40,000 to 50,000 new construction workers until 2027. Moreover, there will be significant demand to replace workers who leave the labour market due to illness and retirement, which is estimated at about 36,000 skilled workers (including 3,840 apprentices) over 2016-2020. Specifically, in order to sustain the ambitious planned housing construction targets and infrastructural investments, skilled trades will be the most requested. Indeed, by 2020 there will be the need for 88,900 skilled craftsmen, including 30,800 carpenters and joiners, 15,200 electricians, 7,900 bricklayers and masons, 13,900 plasterers and tilers and 11,800 heating/ventilating engineers

Ireland's construction workforce needs to upskill, particularly in response to the growing need for renovation and building performance professionals. The drive towards international markets also further changes the necessary skills. Further upskilling to gain experience in areas such as Building Information Modelling (BIM) and Information Technology will enable the sector to develop more efficient administrative processes. To be able to address these needs, several actions are in place in Ireland.

The Irish construction sector is highly homogenous in terms of nationality, with over 90% of the workforce being Irish citizens. This is far below the levels recorded in other EU countries. As the Irish economy is close to reaching its full employment capacity, the sector expects the share of foreign workers to increase⁶⁴.

Italy

The industry is facing a shortage of different skills mainly due to the declining labour force post- Italian crisis and the resulting strong emigration flow from young Italian construction professionals.

Particularly, there will be a surplus in low skill occupations, mainly painters, building structure cleaners and related trades workers, building frame and related trades workers, sheet and structural metal workers, etc. But high skill occupation construction managers, architects and professionals that have both technical and management skills, are also in shortage. Better interaction between higher education institutions (imparting technical knowledge) and companies (providing practical and managerial experience) is thus necessary to address the skills gap observed in the Italian construction sector. Furthermore, the quality of vocational education and training (VET) varies considerably across the country, since it is predominantly coordinated at the regional level. Typically, the skills demand in the North is better defined than in the South, and VET is tailored accordingly.⁶⁵

⁶⁴ European Construction Sector Observatory, country report Ireland, January 2020 p.20

⁶⁵ European Construction Sector Observatory, country report Italy, November 2019, p. 20

In the construction sector, economic studies should be analysed in order to make a census of unemployed workers who need to be trained. It's also necessary to retrain workers of the sector into specific skills and integrate them with the collaboration of bilateral sectorial bodies which provides companies the instruments to improve worker's skills.

It is now crucial that VET providers and enterprises take on specific roles in minimizing skills shortages and ensure high quality training services for the construction sector. Our training schools work closely with companies and social partners in order to guarantee the respect of quality and training needs.

The key skills and competences related to digitization and technologies in the construction sector will therefore require specific professionals figures as: the materials technologist who is a professional figure who researches and studies, through chemical, physical and mechanical methods, the structures and properties of materials and their interaction with the environment; the Project Manager who evaluates and appropriately manages the risks associated with a project, manages resources and integrates all business processes, makes a detailed analysis of the benefits controls the quality of the project and maximizes the yield of the project; finally, the Data Analyst who collects data from different market sources, organizes and structures them and then analyses them and obtains useful information for the business of his company.

The interaction between different trades also needs (border skills) to be improved in order to achieve more effective energy efficiency measures. Therefore, it is necessary to provide training modules for this and organize practical training courses setting up training building site. In this way, VET should be experimental setting not a frontal teaching technique but a more effective and participatory one.

The Italian construction industry is experiencing a 'substitution' effect, wherein the domestic workforce has declined and is replaced by a growing population of foreign workers.

Despite being often as skilled as the local counterparts, they are typically hired for unskilled (and thus cheaper) work, constituting a suboptimal use of human capital.

According to the Skills Panorama research, future employment growth in the Italian broad construction sector over the period 2018-2030 is expected to reduce (-2.7%), while that of the EU-28 is expected to grow by 4.3%⁶⁶.

It is important to invest in skills and in effective and transparent communication of the objectives set and the processes to be launched, in order to progressively build a system of training, support and verification. It would be necessary not to remain more aware for the public decision-makers, but it would be necessary to give a greater support to consumers in order to encourage companies to take into account environmental aspects such as energy efficiency, circular economy and pollution in their production processes.

⁶⁶ Skills Panorama: Country - Italy; Sector - Construction.
https://skillspanorama.cedefop.europa.eu/en/countries/italy?field_sector_tid=86&field_occupation_tid=



It is necessary to support and motivate the construction companies to improve the culture of lifelong learning in enterprises, vocational education and training centres.

Lithuania

There has been a consistent decline in the share of working age population in Lithuania, resulting in an increase in work-related immigration with a majority of third-country nationals occupying jobs requiring medium skills, particularly in the transport, construction and service sectors. Moreover, the employment rate difference for people with different skills levels is critical. For instance, in 2017, the employment rate for the low, medium and high-skilled employee stood at 44.0% (compared to 55.0% in the EU-28), 70.0% (compared to 73.0% in the EU-28) and 90.0% (compared to 84.0% in the EU-28), respectively⁶⁷.

In terms of employment by profession, over the 2010-2018 period, the demand for craft and related trade workers, professionals, managers, technicians and associate professionals in the narrow construction sector has increased by 31.1%, 20.5%, 12.8% and 8.7%, respectively. Plant and machine operators and assemblers witnessed the biggest decline of 11.7% over the same period⁶⁸.

In Lithuania, construction workers, bricklayers and professionals in the furniture industry rank among the professions with highest demand. Nevertheless, the construction sector is affected by both skilled and unskilled labour shortages, mainly for building construction labourers.

According to the study published by Lithuanian Confederation of Industrialists (Lietuvos pramonininkų konfederacija (LPK))⁶⁹, welders, mechanics, engineers, electricians, painters, locksmiths, assembles, millers, tailors, trimmers, plastic moulding specialists and assisting workers in production were also on high demand in 2017. These shortages are primarily linked to the fact that going abroad construction workers enjoy better working conditions and higher pay. The shortage of construction workers, as well as other skilled manual workers is affected also by a limited amount of young people undertaking VET and as a consequence of emigration of skilled manual workers to countries offering considerably higher salaries.

In addition to overall bottleneck vacancies, the construction sector is expected to need 35,000 to 40,000 workers to be trained in energy-efficiency of buildings, even though no official data is available on the number of already trained workers. Nevertheless, according to a survey conducted among construction companies, it is reported that about 40% of workers have received training in energy efficient construction of buildings, while 30% have been skilled in renewable energy.

In order to improve the qualification of Lithuanian construction workers, several initiatives have been launched. Notably, the Lithuanian construction sector development guidelines for the period 2015-2020 sets the objective of encouraging high-skilled training and continuous professional development, including the promotion of professional qualifications in accordance with market needs, as well as the use of EU programmes such as Build Up and Erasmus+ for developing effective trainings.

⁶⁷ European Commission (2019). European Semester Country Report. Lithuania. https://ec.europa.eu/info/sites/info/files/file_import/2019-european-semester-country-report-lithuania_en.pdf

⁶⁸ European Construction Sector Observatory, country report Lithuania, January 2020 p.20

⁶⁹ <http://www.lpk.lt/>

Poland

In 2018, the job vacancies (according public statistics based on employment offices data) in the narrow Polish construction sector reached 24,673. The job vacancy rate has recently gone up. In fact, according to employers' organizations, the labour shortage in construction in 2019 reached 150,000 (qualified and unskilled).

Employers find it difficult to fill vacancies mainly for manual and skilled workers such as bricklayers, roofers, plasterers, insulation fitters.

A great number of Polish construction professionals preferring better working conditions and better wages, decided to migrate to EU countries, mainly the United Kingdom, Germany, the Netherlands, Belgium.

It is one of the major factors contributing to the shortage of workers and skills in the sector. As a result, construction sector companies are forced to hire foreign construction workers from "third countries", mainly Ukraine. This involves many problems, not only related to the employment procedure, but also recognition of qualifications. Formal qualifications acquired in third countries are not recognized in Poland, and employees from these countries are usually employed as unskilled.

According to the national survey published in the 2018 report "Barometer of Occupations", the most in-demand professions of the construction sector are concrete placers, concrete finishers and related workers, pavers, construction joiners and carpenters, roofers and sheet metal workers in building trades, construction installation assemblers, bricklayers and plasterers, earthmoving plant operators and mechanics, finishing work technologists in building trades and construction workers⁷⁰.

The report prepared at the request of the Sector Council for Competence in Construction also indicates the problem of shortage in terms of new qualifications and skills related to smart specializations in construction. There is a shortage of employees in the field of low-energy construction, project managers in this field, construction managers and employees using BIM, specialists dealing with the recovery of building materials and waste management.

More information on the real needs of the construction sector in terms of skills may be provided by the ongoing Human Capital Sector Survey (BBKL - completion planned for spring 2021).

Portugal

Investment in education and training will gain effectiveness if supported by needs assessment system. However, this system must be improved.

In Portugal there are Professional Training Centers that aim to Qualify and Certify Professionals. The courses may be Dual Certified: School and Professional, being divided into Adult Education and training courses, learning courses, technological specialization courses and Certified Modular Training.

⁷⁰ European Construction Sector Observatory, country report Poland, November 2019 p.19.



The Dual Certification Courses have an integrated internship that allows adaptation to the business environment. The program contents are based on References inserted in the National Qualifications Catalogue of ANQEP (National Agency for Qualification and Professional Education).

Certified Modular Training is aimed at assets looking to improve their skills and also to the unemployed who may have a job offer soon. This Training takes place after working hours.

Technological Specialization Courses allow to obtain a more advanced Certification, at post-secondary level.

Professional training in areas of the sector guarantees adaptation to market demands, adapting courses with new subjects in face of requirements and improves the level of qualifications and education and prepares professionals for the best performance in the sector.

In order to better align the needs of the market with the skills provided by the education system, the National Agency for Qualification and Education and Professional Training (ANQEP) developed a tool called "Qualification Needs Anticipation System", which aims to survey needs in the labour market. This information generates a level of training priorities "nothing priority, normal priority and very priority", important indicators for vocational training entities, project training forecasts for the following years and make the best planning.

The various professions in the civil construction, energy and cross-sector professions, developed in Portugal, in the various modalities described above, have their programs available, in the National Catalogue of Qualifications website, a research space of ANQEP, of the levels 2, 4 and 5 of the European Qualifications Framework:

- Paver (M/F)
- Plumber (M/F)
- Carpenter (M/F)
- Driver / operator of lifting machinery (M/F)
- Driver/ operator of Earthmoving machinery (M/F)
- Electrician of Installations (M/F)
- Tiler (M/F)
- CAD Operator - Civil Construction (M/F)
- Bricklayer (M/F)
- Painter of Civil Construction (M/F)
- Administrative technician (M/F)
- Building construction manager/technician (M/F)
- Civil Construction Drawing Technician (M/F)
- Electrical installation technician (M/F)
- Electronics, Automation and Command Technician (M/C)
- Electrotechnical Technician (M/F)
- Installer technician of wind systems (M/F)
- Installer technician of photovoltaic solar (M/F)
- Installer technician of thermal systems of renewable energy (M/F)
- Logistics technician (M/F)
- Management Support Technician (M/F)
- Measurements and Quantity Technician (M/F)
- Safety at work technician (M/F)
- Sales technician (M/F)

- Topography technician (M/F)
- Expert technician of construction management (M/F)
- Technical Specialist in Energy Management and Control (M/F)
- Expert technician of energy rehabilitation and infrastructures conservation - buildings (M/F)

In 2017/2018 the government launched the 'Passport Qualification', as an instrument of guidance and individual registration and competence, digital with access by itself and by training entities. This instrument records all the qualifications and skills that the individual acquires or develops throughout his life; school or professional skills.

In Portugal, the increase in recent years, in sectors such as tourism, has boosted the growth of the construction sector, which began to show signs of growth, namely, in large urban areas such as Lisbon and Porto, specifically in remodelling and conservation of buildings already existing. This increase in job offers in the construction sector registered an increase of 132% in 2018 compared to the previous year.

The increase in demand for workers in the construction sector has led to a shortage of essential professions such as plumbers, bricklayers, carpenters, plasterers, painters, in addition to other more technical ones, such as measurements and budgets, and it is estimated that this shortage can be felt even more in the next years. In order to highlight this gap between supply and demand, there is still to be considered the departure of Portugal or the professional retraining of many professionals, in the period most felt the crisis in the sector, in 2011.

Currently the professions in the civil construction sector in Portugal, continue to be unattractive for young people and adults, in addition it continues to be poorly paid. According to the heads of several business associations, it is necessary to value the various professions, be they basic or more technical, with digital components and sustainability of construction.

In order to increase the attractiveness of the sector's professions, namely in professional training, the Portuguese government launched a political initiative "Portugal InCode 2020 - National Initiative for Digital Skills and 2030", with the objective of introducing digital skills, in the sector's professions and making them more attractive to the general public.

There are also private and public entities working to improve and to attract the sector, such as the Sustainable Construction Portal (PCS) of the order of architects, which is dedicated to promoting sustainable forms of construction, developing training and consulting.

The Energy Agency - ADENE (Energy Agency - ADENE) also offers training modules for construction professionals with a focus on energy efficiency skills. It also introduced an online platform that allows quick and effective access to available courses and to select those that best adapt to the needs of each user.

The changes in the labour market resulting from a new technical-economic and competitiveness strategy reinforce the importance of:

- Information management;
- Flexibility;
- Decentralization of the initiative;
- Importance of quality;
- Centralization in the market;



- Organization for innovation.

With a shortage of qualified personnel, low appetite for professions in the sector, displacement of qualified personnel to other countries and low salaries that do not encourage entry into the sector, the focus is on recruiting qualified professionals and also on Internal Training in order to face the new requirements of the sector in terms of skills, knowledge and attitudes.

Thus, there are two fundamental axes, initial and continuous training that meet the need to qualify human resources to increase quality at work.

The training must be strongly based on existing needs (Information Technologies, Renewable Energies, Circular Economy, Energy Certification) and appropriate to innovations. It also brings development and generates more interest in the entry of young people into the sector. If the sector is attractive, the incentive to exercise professions increases.

The behavioural component must not be overlooked, it is very important to promote adaptability to new challenges and functions, creating psychosocial skills.

This means that behavioural aspects are extremely important, allowing the individual to adapt more easily to changes in the sector. For this, it will be necessary to strengthen skills in the behavioural area.

We must know how to embrace change with an optimistic and proactive stance.

This competence is increasingly important and is based on the following principles:

- Learn from others;
- Search for qualification;
- Ask;
- Learn how to manage errors.

Slovenia

According to the Chamber of Commerce and Industry of Slovenia, the narrow construction sub-sector is lacking skilled workers due to i) low worker's interest in the construction sector (as workers are paid low salaries); and ii) the low number of graduates finishing a degree in the field of construction. In addition, the Chamber aims to improve labour market conditions, to better respond to the fluctuation of the number of projects construction companies commit to, especially in the context of public procurement related projects.

Among the bottleneck vacancies in the broad construction sector are carpenters, joiners, plumbers, pipe fitters, mechanical and electrical engineers. The shortage of skills is partly due to the poor working conditions, such as heavy workload, exposure to bad weather, and unsocial working hours. Moreover, construction companies have been responding to the fluctuating market conditions by limiting wages and hiring less, even during more profitable periods, since this improves their chances of survival during less favourable times⁷¹.

⁷¹ European Construction Sector Observatory, country report Slovenia, November 2019, p.15

Special skills training related to energy efficiency and the construction sector were and are tackled over the last years due to many EU initiatives (BUILD UP SKILLS, ERASMUS+, LIFE+) in which organizations from Slovenia participated. However, new legislation requirements on energy performance, green public procurement or in relation to national ECO FUND open calls on renovation is needed.

Many regional organizations and companies across Slovenia offer sector specific training and seminars as cVET. The problem is that construction companies are in general not obliged to take part on it and participation on those courses more or less depend on companies' aims, strategies and funds available for cVET.

In comparison with other EU countries, in Slovenia no new construction profiles (occupations) were developed regarding energy efficiency in the construction sector, only specific modules were added in the VET curriculum. This is a very common proceeding since Slovenian VET system 3-6 NQF level has some specifics, e.g. it allows open curriculum and approximately 20% of school lessons are able to focus on different topics, according to sector needs or pupils' tendencies.

It can be concluded that sectoral skills gaps are slowly closing via up-skilling of workers (internal and external training in companies) and changing VET curricula for pupils.

Spain

Experts believe that the focus in vocational education should be put on the quality of the training, the attractiveness of the sector and the creation of further job opportunities. The construction sector has traditionally been one of the main employers of relatively low-skilled workers. This is the case particularly for young people aged 15-24, educated below upper secondary level. Many of these, currently unemployed, will need to be retrained, especially taking into account new (technological) development in the construction sector. Skills shortage is a key issue, that may impede the growth of the sector especially in the big cities (such as Madrid and Barcelona), which is expected to hire 150,000 workers in the next few years.

Furthermore, skills polarisation and skills mismatches also affect the performance of the labour market in Spain and weight on the productivity growth. In 2018, the proportion of low and high qualified adults on total employment in Spain stood at 32.8% and 43.2% respectively. This is above the EU-28 averages of 16.3% and 35.8% respectively. However, the proportion of mid qualified adults (23.9%) stood below the EU-28 average (47.7%)⁷².

Due to the economic, structural and social barriers in the Construction Industry in Spain it is necessary to provide training in order to solve the gaps in workers' qualifications. The new tendencies force an efficient and flexible response for training on diverse fields such as the BIM methodology, industrialized construction or sustainable construction. According to the Status Quo analysis⁷³, ten would be the building occupations with the greatest importance in Energy Efficiency (EE) and Renewable Energy Systems (EERR) with the major needs for training: operator for sealing joints, assembler of aluminium and PVC carpentry, installer of thermal solar installations, bricklayer, installer of heat generation

⁷² European Construction Sector Observatory, country report Poland, January 2020 p.17.

⁷³ http://www.buildup.eu/sites/default/files/bus_projects/build_up_skills_spain_hoja_ruta_final_es_1.pdf

systems: geothermal, installer of heat generation systems: biomass, plumber, installer of photovoltaic installations, installer for DHW and air conditioning systems.

Bearing in mind the above list, the competencies that would require qualification and training according to the status quo memory would be carpentry and PVC aluminium, exterior enclosures, roofs: insulation, partition walls: insulation, ACS and air-conditioning installations Plumbing installations, gas installations, electrical production equipment and electrical installations.

Conclusions

Partner country reports show that technological advances bring a number of new and emerging practices, which are likely to change the landscape of the construction sector; the use and combination of materials in construction is evolving and, as a result, this increases the demand for specific skills; that technical skills are also very important in off-site construction and construction roles, such as computer-aided design. Furthermore, it is clear that climate change calls into question the need for greater energy efficiency. Therefore, the development of "green" buildings and sustainable waste management has emerged, and the energy sector will also be an important driver of demand for specific skills for construction workers.

From the analysis of the report it was found in the partner countries:

- Inadequate offer of qualified craftsmen.
- Skills gaps in all building trades.
- Lack of candidates available for apprenticeship.

Each country agrees that in order to overcome this obstacle, they should develop training actions that are more related to the specific economic activity, in particular to increase the demand for jobs with medium and high skills qualifications.

Availability of skilled workforce and the acquisition of new skills are challenges that are highlighted by all partners.

The sector skills gaps could be identified in main areas of work:

- ICT- Digitization for example BIM and smart specifications in construction.
- Green and ecological work for example Energy efficiency, renewable energy system, wood construction, recycling, new materials, reuse of construction waste
- Safety and Healthy at work especially for the new emerging risks about the green construction activities and digitalization work
- Soft skills such as communication among workers or teamwork.

6. BARRIERS⁷⁴

After analysing all the documents received, we have grouped the barriers in the macro area that will be assessed for each single country. The areas identified are:

1. Political / legislative
2. Economic / Social
3. Structural
4. Education

6.1. POLITICAL / LEGISLATIVE

The main political barrier which is faced by the construction industry in **Belgium** is the lack of measures taken by the government to face labour shortage. A special attention must be paid to activation and retraining of workers to scarce occupations.

Besides, high labour costs make Belgian companies less competitive on the international market.

In **Finland** planning (zoning) is slow and rigid. Finnish society and behaviour are characterized by low bureaucracy. When political decisions and new legislation are putting into practice, there is an identified need for implementation actors.

In **France** there is a real need of investments to undertake energy renovation of buildings, but the stakeholders (promoters, households, etc.) cannot obtain a return on their investments due to the low level of energy prices. Besides, public incentives are multiple and complex. Even if they cover a wide range of situations, depending on the customer's point of view or in relation to the project, only a strong and stable public support could contribute to the achievement of the objectives.

In **Germany** the difference between the requirements of companies and young people who have recently left school is too great as far as technological know-how is concerned. This applies in particular to (young) people from the lower social strata-.

In **Greece**, a major obstacle to the development of the sector is the auctioning and awarding of public works. Excessive discounts in competitions make it imperative to develop and implement a reliable system to locate Unusually Low Tenders (FDI) and to exclude them from competitions. The development of the National System of Technical Specification and Pricing of Public Works is a prerequisite for smoothing the problems in the public works procurement system. Strengthening the construction activity can only come from stimulating investment in new houses and other buildings.

In **Ireland**, the lack of participation in the training of apprentices is due to three main obstacles: the lack of incentives from the government; the cost of releasing apprentices out of work; legislative obligations are too burdensome.

In **Italy**, there is not a specific national law on urban regeneration, but only local laws. For this reason, it is necessary a national coordination, a control room to make the sector develop and not to stop

⁷⁴ Economic, administrative, structural, educational, cultural



important initiatives of growth. There is a lack of specific measures to effectively implement the urban regeneration through the renovation of energy-intensive buildings. This national situation causes even other problems linked to the loss of employment in the sector.

In **Lithuania**, digitalisation of construction industry also interlinked with whole life-cycle phases of construction projects as well inspection and maintenance are facing new challenges related to the adoption of new rules and regulation (Legislative issues). In general Lithuania is starting and adopting digital construction regulations slowly. Nevertheless, new digital initiatives lack political support which will become a key issue in the upcoming years.

Moreover, all three environmental aspects such as energy efficiency, circular economy and pollution are very important for companies in their production processes. In the first place it is energy efficiency during the renovation of apartment buildings and public buildings. Moreover, recycling and waste management is also very important issue, as well as circular economy.

In **Poland** formally, there are no legislative or political barriers in adapting the vocational education and training system to the real needs of the construction sector. In practice, however, all legislative changes relate to the formal education sector (sectoral schools). There are still no legal regulations ensuring high quality of non-formal (out-of-school) education and training. There are also still insufficient legal regulations to recognize the results of informal learning.

The lack of legal basis for creating paritarian funds in **Poland**, including funds promoting training and education in construction, can be considered a barrier in the development of skills for the construction sector.

In **Portugal**, renewable energies are expensive and involve a lot of bureaucracy in the implementation which discourages civil construction.

In **Slovenia**, changing the legislation is complex, slow. For the construction industry, the Green Public Procurement Regulation is far less ambitious and does not encourage contracting authorities to plan greener construction or incorporate recycled building materials. The BIM Enforcement Action Plan is still in the process of being approved. In the light of reaching the lowest prices for construction tenders, third-country construction service providers are selected with which the country does not have bilateral cooperation agreements. There is clearly a lack or poor functioning of state economic diplomacy which in the end means poorer country economy and slow and minor GDP growth.

In **Spain**, the legal framework hinders the possibilities of financing rehabilitation projects. The urban legal framework could limit the possibilities of new building developments.

6.2. ECONOMIC / SOCIAL

In **Belgium**, a high VAT rate for demolition and reconstruction works hinders the renovation of existing buildings. A national VAT rate of 6% for demolition works would boost renovation works and improve energy efficiency of existing buildings.

In **Finland**, funding for basic vocational training has been cut by about a quarter over the last five years. The new government was just elected and drew up its own program for the four next years. Although promises have given to increase funding of VET, the population is aging rapidly, and the birth rate is



falling at the same time. Also, the availability of labour is becoming even more difficult and economic conditions are worsening

In **France**, either production process requiring staff presence in companies or the lack of effectiveness of some training paths, companies have difficulties to free their employees during some days for a face-to-face training. Therefore, alternative pedagogical methods should be developed such as training in a work situation or a reinforced tutoring or companionship. Besides, the main economic risk for the activity would be a restricted access to credit, for both construction companies (cash flow issues) and customers (projects' financing).

Economic barrier could be found in Germany when considering digitising some work process. Established work routines are replaced by new methods and technologies which must be learned first in order to function smoothly.

In **Germany** as difficult as it is for the construction industry to attract young people to construction jobs as skilled workers, it also seems difficult to retain them once they have obtained their skilled worker status. According to Sozialkasse Bau (Social Security Fund of Construction) (SOKA-BAU)⁷⁵ statistics, over 70% of employees with a degree leave the industry after 5 years at the latest.

In **Greece**, the reduction of bank financing and the reduction of household income are an issue but the imposition of high taxes on real estate has also had a significant impact.

In **Ireland**, Skills gaps have emerged across the full range of construction trades and are most pronounced in the “wet” trades (e.g. Plastering). The shortage is so severe that there exists the potential for long term problems, such as is the case of floor and wall tiling, where no new apprentices have been registered in the last number of years mainly due to the perceived image of the industry as dirty and heavy work.

In **Italy**, a strong contraction of credit in the construction sector prevents any strengthening of the corporate organization. Also, there is a limited availability and quality of labour. Companies with a low level of innovation are an obstacle to the professional growth of workers.

In addition, the recycle of demolition waste is too expensive and up to today a national decree for the implementation of the management of demolition and construction wastes, as end of waste, is missing. This leads the sector's operators to manage these materials as wastes and not to recycle them. There are companies that try to operate in a sustainable way, despite the legislative barriers, but there are not national incentives and simplified bureaucracy to support them.

In **Lithuania**, the main barriers are increase of construction costs and the lack of skilled and unskilled workforce. Moreover, construction sector is facing the largest occupational shortages in the country which means low prestige of the builder's profession, poor working conditions for construction employees and no nationally established system for certification of construction workers which would prevent from unprofessional construction and installation.

In **Poland** most employers and employees in Poland still believe that the state should pay for vocational training. Even when they are involved in supporting vocational training, employers treat it as a form of

⁷⁵ <https://www.soka-bau.de/>



CSR not as investment or system action. But at the same time, as a rule, they must invest in practical training of new employees, because they are practically unprepared to perform professional tasks. Employees, especially employed in worker positions, rarely invest their money in organized education, because they believe that it is not profitable to invest in an unstable market and it has little impact on their position on the labour market.

No Polish government will give up funding for vocational training for political reasons. In the same time the school financing and management system is highly decentralized, which hinders rational policy at the national level. Recently promoted dual education requires funding from employers.

In **Portugal**, there is a poor image of the Construction sector based on traditional training, low wages of workers, difficulties for companies in finding financial support and low credit costs.

In **Slovenia**, the sector is defined by low productivity (low added value per employee compared to for example IT), relatively low wages, low investment in R&D and equipment, the less attractive jobs, which worsen the image of the industry. Moreover, it also leads to less interest of young people to be part of the sector which means lack of staff in the labor market and aging working population in the sector.

Regarding economic barriers, two major barriers can be identified: a lack of capital and executive capacities – daily and short term run- and a need for working in the informal economy to achieve liquidity of a company cash flow. In **Spain**, the economic crisis has damaged the sector and it is still on recovery. Also, there is a lack of qualified work force, high migration rates and ageing workers.

6.3. STRUCTURAL

In **Belgium** one of the main structural barriers is the fragmentation of the construction process. This leads to a lack of collaboration between architects and contractors, which are mainly SMEs.

In **France** the professional structure of the construction industry, based on an organization in trades/crafts, will be challenged in the coming years, due to new environmental, organisational, technological and other evolutions. Indeed, the strong demand from the main contracting authorities for a strengthening of manufacturer warranties linked to deadlines, costs and compliance with regulations will become essential. Training and skills development programmes will have to consider these aspects.

Lithuania set to implement several structural reforms in order to tackle new challenges in the rapidly changing world. Some of them such as Education reform (Education for future), Tax reform, reform to combat shadow economy, innovation reform (Lithuania does not fulfil its potential in science to develop new products. Lithuania set the goal to promote innovation-based industries which would form the foundation of the country's economy).

Germany faces structural barriers when they change their working procedures from analogue to digital. One reason is that there does not exist one standardized process to digitise all the companies in the construction industry. Structural barriers exist as well in terms of mobility. Some companies and construction sites are located in areas that are difficult to reach by public transportation. Consequently, digitization could help to ease the data access for workers and employees, working at home or at another building sites. By the way travel costs could be saved and maybe work live balance could be optimized.



In **Italy**, the construction sector is characterized by a very large number of small, unstructured enterprises for staff training, and for this reason a European strategic plan for innovation and the financing of training is indispensable.

In **Poland**, educational system stakeholders (especially schools and universities) have their own internal interests, primarily related to the need to maintain employment and reluctance to change frequently. To solve this problem, we should find how to ensure flexibility of education for a market that accelerates in the area of technology and work organization and is increasingly generating new needs in terms of skills and competences.

In **Portugal**, it should be invested in dissemination of new technologies and the promotion of EE and circular economy, for instance, preventing construction companies to enter into the market if they not comply with the standards.

In **Slovenia**, the sector has to be transformed with new business models, price policies and careers opportunities. In **Spain**, the vast majority of construction companies are SMEs. It is therefore in SMEs, where the real need for training lies. Mainly because the relationship between the size of the company and training activities is directly proportional: for the workers of an SME the access to training is more complex than for the workers of a large company, which usually has a training plan.

6.4. EDUCATION

In **Belgium** there are some problems areas connected with training courses, training supply, access to training courses and lack of qualified workforce. Moreover, efforts should be put on “Dual training” so that it becomes a path of excellence for the training of young people with opportunities of continuing education.

In **Finland** traditional vocational schools have not been very flexible. This is based on hierarchical structure of education, with a strong control of the Ministry of Education. training of teachers is a big challenge and may become a barrier to training new skills. However, the SME sector expects the trainers to take the initiative and, on the other hand, the public sector to invest in training the workers.

However, from the beginning of 2018, the vocational education reform⁷⁶ will enter into force in Finland and will provide completely new opportunities for study, flexibility, individuality and cooperation in working life. The reform, on the other hand, offers opportunities for flexibility, while at the same time seeking to precisely define some operating models of VET. Regulation will thus continue after the reform. However, the curriculum offers some opportunities to tailor studies according to local demands while maintaining government funding. The latest reform in the current government program is the reform of continuous learning⁷⁷. It is to alleviate skills shortages and to improve upskilling opportunities for working age people.

In **France**, young people’s orientation is mainly based on grades and scores. The best pupils are directed towards general training while the less talented are oriented to the vocational field, which devalues the latter group. This culture is deeply entrenched and shared by families and teachers and makes it difficult

⁷⁶ <https://minedu.fi/en/reform-of-vocational-upper-secondary-education>

⁷⁷ https://minedu.fi/en/article/-/asset_publisher/jatkuvan-oppimisen-uudistus-kaynnistyy-tavoitteena-helpottaa-osajapulaa-ja-sujuvoittaa-tyoikaisten-osaamisen-paivittamista

to undertake actions to improve this system. However, there are initiatives aiming at promoting the VET system in the construction industry and apprenticeship is strongly supported by both public authorities and social partners.

In **Germany**, School preparation in the MINT (EN: mathematics, engineering, natural sciences, technique) occupations would have to be improved in terms of training spatial perception (visual thinking). For example, young students need to have an imagination what 1 Cubic meters in practice looks like. In the training, contents are presented in an action-oriented way, so that topics such as mathematics and technology are not embedded in general knowledge but are taught as necessary for practical implementation.

A rather significant role in vocational training attracting the interest of young people - regarding specific specialties - seems to be the existence of non-statutory professional rights. It is characteristic that when the construction sector in **Greece** in the previous decade was highly developed, the relevant specialties were underrepresented in the vocational Lyceums due to the lack of regulated professional rights for medium and low-level craftsmen, despite the fact that these professions require increased knowledge and skills (i.e. building contractors, builders, alumni craftsmen, metalworkers, carpenters, furniture makers, etc.)

In **Ireland**, the lack of investment by employers in VET was emphasised as a significant barrier to upgrading the VET provision to include a greater work-based component. Some employers' associations run their own training centres and it is possible that these fill a gap in VET provision. To overcome obstacles significant changes will be required including upskilling teacher training, improvements to facilities and teaching resources, increasing work-based learning, improving co-ordination of the existing fragmented VET provision, strengthening the institutional framework of governance, regulation of training and qualification standards and increased funding. There are some changes starting to emerge in this area.

In **Italy** higher education and vocational schools should be more flexible in order to serve businesses and satisfy the labour market needs. For this reason, educational programmes should be more practical and not only theoretical. In fact, the construction sector needs specialized professional figures in order to train way new workers in a proper. It's fundamental to have a training plan to create new skills and develop the ones already existing for a constant updating of workers especially on technological evolution.

In **Lithuania**, the shortage of construction workers, as well as other skilled manual workers is affected also by a limited amount of young people undertaking VET and as a consequence of emigration of skilled manual workers to countries offering considerably higher salaries.

In **Poland** the problem is the inflexibility of school and tertiary education and too slow adaptation to the changing needs of the labour market. Another problem is the lack of contact between public formal education and private non-formal education. Training institutions do not shape the vocational training market but respond to narrow needs - in line with their commercial nature. It is worse - training companies quite often successfully create demand for vocational training for which there is no real demand on the labour market. In Poland this was also the case with a large group of private higher vocational schools that "produced" graduates unnecessary on the labour market.

In **Portugal**, training should be adapted to new realities and a European Strategy promoting vocational training and qualification is demanded.

In **Slovenia**, the shortage of construction workers, as well as other skilled manual workers is affected also by a limited amount of young people undertaking VET and as a consequence of emigration of skilled manual workers to countries offering considerably higher salaries. Big challenge poses funding of cVET courses for onsite workers, the revenue generated in this sector does not allow companies to invest in cVET and building careers or upskilling of employees. The timing of cVET training course is considered a problem especially for onsite workers.

Many skilled workers are looking for other jobs, mainly in procurement of equipment, in other sectors or even abroad. Nevertheless, some companies have already reported that they were not been able to find proper (skilled) workers for works they have won on tenders, and had to train the ones applied for these jobs.

In **Spain**, there are difficulties on accessing to subsidized training by the self-employed. There is not enough demand for training at the lowest skill levels and the one which is available is not adequate. In this sense, it is necessary to consider that the professional training offer is created regarding demands, currently, does not seem to be in accordance with the needs that experts detect in the sector. Moreover, traditionally, most of construction workers have failed at school, which generally leads to a lack of initiative and disinterest in specialising the workers at the lowest levels of the sector do not have the habit or motivation to favour their training, which is why the obligatory nature of training in energy efficiency, circular economy and digitalization is proposed as desirable.



7. REFERENCES

Belgium

- ✚ Confederation Construction Annual Report 2018
- ✚ Tendances et innovations dans la construction – Etude CEFORA in collaboration with KU Leuven
- ✚ European Construction Sector Observatory, country report Belgium, December 2019
<https://ec.europa.eu/docsroom/documents/40642>
- ✚ La construction numérique, balises pour une transition réussie – Rapport annuel 2016-2017 – Confédération Construction
- ✚ <https://www.techitaly.eu/circular-economy-in-belgium/>
- ✚ <http://www.odyssee-mure.eu/publications/efficiency-trends-policies-profiles/belgium.html#buildings>
- ✚ Build Up Skills Belgium – Analysis of the national status
www.smm.lt/web/lt/smm-svietimas/profesinis-mokymas

Finland

- ✚ Motiva – a Sustainable Development Company – <https://www.motiva.fi/en/motiva>
- ✚ European Construction Sector Observatory, country report Finland, November 2019
<https://ec.europa.eu/docsroom/documents/39802>
- ✚ Build Up Skills Finland – <https://www.motiva.fi/en/motiva>
- ✚ Finnish Green Building Council – <https://figbc.fi/en/green-building-council-finland/>
- ✚ Ministry of Environment - https://www.ym.fi/en-US/Land_use_and_building
- ✚ Ministry of Education - <https://minedu.fi/en/vocational-education-and-training>
- ✚ Finnish National Agency for Education
https://www.oph.fi/english/curricula_and_qualifications/vocational_upper_secondary_education
- ✚ The Confederation of Finnish Construction Industries RT -
<https://www.rakennusteollisuus.fi/English/Frontpage/>
- ✚ VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD - <https://www.vttresearch.com/>
- ✚ The Finnish Construction Trade Union - <https://rakennusliitto.fi/en/>
- ✚ KIRAHub - <http://www.kiradigi.fi/en/front-page.html>
- ✚ University of Tampere - <https://www.tuni.fi/en>

France

- ✚ Tendances BTP. Bulletin d'information. CCCA-BTP, N° 1. Mai 2019
- ✚ Le Bâtiment en chiffres 2018. FFB, Mai 2019
- ✚ European Construction Sector Observatory, country report France, January 2020
<https://ec.europa.eu/docsroom/documents/40289>
- ✚ Mines Revue des Ingénieurs #483 Janvier/Février 2016. Available on : https://www.mines-nancy.org/global/gene/link.php?doc_id=3301&fg=1

- ✚ Plan Bâtiment durable. Rapport d'activité 2018. Available on : <http://www.planbatimentdurable.fr/publication-du-rapport-d-activite-2018-la-filiere-a1348.html>

Germany

- ✚ Friedrich Ebert Stiftung - <http://library.fes.de/pdf-files/wiso/15212.pdf>
- ✚ Kompetenzzentrum Digitales Handwerk - <https://handwerkdigital.de/>
- ✚ Federal Statistical Office - https://www.destatis.de/DE/Presse/Pressemitteilungen/2018/06/PD18_194_321.html
- ✚ European Construction Sector Observatory, country report Germany, January 2020 <https://ec.europa.eu/docsroom/documents/40681>
- ✚ Bundesverband Baustoffe – Steine und Erden e.V. – http://kreislaufwirtschaft-bau.de/Arge/PM_21_01_2019.pdf
- ✚ DIRECTIVE 2008/98/EC of the European Parliament and of the council of 19 November 2008 on waste and repealing certain Directives - <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0098&from=DE>
- ✚ Federal Environment Agency - <https://www.umweltbundesamt.de/themen/wirtschaft-konsum/kommission-nachhaltiges-bauen-am-umweltbundesamt#textpart-1>
- ✚ BauInfoConsult - http://www.bauinfoconsult.de/produkte/jahresanalyse_deutschland_2018_2019/57
- ✚ Build up skill Germany Status Quo reports 1-3
- ✚ Federal Ministry of the Interior, Building and Community - <https://www.bmi.bund.de/DE/themen/bauen-wohnen/bauen/bundesbauten/nachhaltiges-bauen/nachhaltiges-bauen-node.html>
- ✚ CODESMA project (circular economy/waste management) - <http://www.codesma.eu/>
- ✚ Tyco(o)nstructor project (transversal skills development) - <https://tycon-project.eu/index.php/sample-page/>
- ✚ WinAPP project (digitalisation in initial VET) - <https://sites.google.com/site/winappcpd/>
- ✚ WinAPP project APP - <https://play.google.com/store/apps/details?id=nl.ou.welten.winapp>
- ✚ Talents4Construction project - <https://www.talents4construction.de/en-gb/home>

Greece

- ✚ Annual report 2014 - <https://www.cedefop.europa.eu/en/publications-and-resources/publications/4136>
- ✚ European Construction Sector Observatory, country report Greece, November 2019 <https://ec.europa.eu/docsroom/documents/39803>

Ireland

- ✚ Cedefop – 2018 skills forecast
- ✚ European Construction Sector Observatory, country report Ireland, January 2020 <https://ec.europa.eu/docsroom/documents/40290>

- ✚ CSO - Central Statistics Office - <https://statbank.cso.ie/px/pxeirestat/Statire/SelectVarVal/Define.asp?maintable=BRA18&PLanguage=0>
- ✚ University of Limerick; Erasmus+ Project DETECTA - Formative Map of the Construction Sector; Jan 2019
- ✚ W. Green Building; World Green Building Trends 2018 - Smart market report; 2018
- ✚ CitA, BICP; Building Information Modelling in Ireland 2017; May 2017
- ✚ IGBC; Towards a circular economy in construction - Assessing low carbon, healthy, responsible products for the construction sector; June 2018
- ✚ Jansi George, John McGrath; BIM: Time to tap into its full potential; Jan 2019
- ✚ CIF, DIT; Trades & apprenticeships skills survey; Feb 2018

Italy

- ✚ Osservatorio congiunturale sull'industria delle costruzioni (feb 2019) - http://www.andil.it/images/ANDIL/canali/centro_studi/ANCE/Osservatorio_Congiunturale_Gennaio_2019.pdf
- ✚ Build up skills – Italy status quo analysis report <http://www.bricks.enea.it/doc/BUILD%20UP%20Skills%20Roadmap.pdf>
- ✚ Cresme - <http://www.cresme.it/>
- ✚ European Construction Sector Observatory, country report Italy, November 2019 <https://ec.europa.eu/docsroom/documents/39524>

Lithuania

- ✚ The World Bank, Group, Doing Business 2019 <http://www.doingbusiness.org/en/data/exploreconomies/lithuania>
- ✚ European Commission; European Construction Sector Observatory, Country profile Lithuania 2018 <https://ec.europa.eu/docsroom/documents/30351/attachments/1/translations/en/renditions/pdf>
- ✚ SKILLS FOR JOBS - LITHUANIA , OECD 2018 https://www.oecdskillsforjobsdatabase.org/data/country_notes/Lithuania%20country%20note.pdf
- ✚ Build up skills – Lithuania status quo analysis report http://www.buildup.eu/sites/default/files/bus_projects/status_quo_analysis_lithuania_eng_0.pdf
- ✚ Statistics Lithuania, Building construction, <https://osp.stat.gov.lt/informaciniai-pranesimai?eventId=185697>
- ✚ European Commission; https://ec.europa.eu/environment/ecoap/sites/ecoap_stayconnected/files/field/field-country-files/lithuania_eio_country_profile_2016-2017.pdf
- ✚ National Energy Independence Strategy of the Republic of Lithuania http://enmin.lrv.lt/uploads/enmin/documents/files/Nacionaline%20energetines%20nepriklausomybes%20strategija_2018_EN.pdf

- ✚ EUROSTAT:
https://ec.europa.eu/eurostat/data/database?node_code=cei_wm010
- ✚ COMMISSION STAFF WORKING DOCUMENT, The Environmental, Implementation, Review 2019:
https://am.lrv.lt/uploads/am/documents/files/ES_ir_tarptautinis_bendradarbiavimas/ES_klau_simai/report_lt_en_2019.pdf
- ✚ EUROSAI WGEA Cooperative Audit,
http://enmin.lrv.lt/uploads/enmin/documents/files/Cooperative_Audit_on_the_Energy_Efficiency_of_Public_Sector_Buildings_final.pdf
- ✚ National Audit Office of Lithuania:
https://www.vkontrole.lt/pranesimas_spaudai.aspx?id=24559
- ✚ Enterprise Lithuania, www.versli Lietuva.lt/lt/analitika/
- ✚ European Construction Sector Observatory, country report Lithuania, January 2020
<https://ec.europa.eu/docsroom/documents/40292>
- ✚ Bank of Lithuania Lithuanian Economic Review (March 2019)
<https://www.lb.lt/en/publications/lithuanian-economic-review-march-2019>
- ✚ CEDEFOP REFERNET Lithuania: VET in Europe reports
<http://www.cedefop.europa.eu/lt/publications-and-resources/country-reports/lithuania-vet-europe-country-report-2016>

Poland

- ✚ <https://stat.gov.pl/>
- ✚ www.lublin.stat.gov.pl
- ✚ <https://www.gov.pl/web/klimat/efektywnosc-energetyczna>
- ✚ <http://www.ibe.edu.pl/pl/projekty-krajowe/zintegrowana-strategia-umiejetnosci>
- ✚ <https://sip.lex.pl/akty-prawne/dzu-dziennik-ustaw/sektorowa-rama-kwalifikacji-w-sektorze-budownictwo-18880111>
- ✚ <http://srkbud.zzbudowlani.pl/>
- ✚ European Construction Sector Observatory, country report Poland, January 2020
<https://ec.europa.eu/docsroom/documents/39525>

Portugal

- ✚ O Sector da Construção Civil e Obras Publicas em Portugal: 1990-2000,
(Maria Ioannis Baganha, José Carlos Marques, Pedro Gois)
- ✚ European Construction Sector Observatory, Country profile Portugal, November 2019
- ✚ Fepicop – Federação Portuguesa da Industria da Construção Civil e Obras Publicas
- ✚ INE – Instituto Nacional de Estatística;
- ✚ IEFP – Instituto do Emprego e Formação Profissional, I. P.;
- ✚ Banco de Portugal;
- ✚ Observatório das Obras Públicas;
- ✚ IMPIC, I.P. - Instituto dos Mercados Públicos, do Imobiliário e da Construção, I.P. - Análise económica e financeira

- ✚ Associação Portuguesa dos Comerciantes de Materiais de Construção - Plano Estratégico para a Fileira da Construção, 2014-2020.

Spain

- ✚ IDAE website, Gobierno de España. Ministerio para la Transición Ecológica.
<https://www.idae.es>
- ✚ Observatorio de la Fundación Laboral de la Construcción, Informe sobre el Sector de la Construcción 2018
- ✚ Plan nacional integrado de energía y clima 2021-2030
- ✚ Final circular Economy package, European Commission
- ✚ Sustainable building communication, European Commission
- ✚ Build up skills: Energy training for builders, Spain. National roadmap Construye 2020, 2013
- ✚ European Construction Sector Observatory, country report Spain January 2020
<https://ec.europa.eu/docsroom/documents/40684>



<http://constructionblueprint.eu/>