**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

---

<table>
<thead>
<tr>
<th>VET PROVIDERS</th>
<th>SECTORAL REPRESENTATIVES</th>
<th>COUNTRY</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLC (COORDINATOR)</td>
<td>CNC</td>
<td>SPAIN</td>
</tr>
<tr>
<td>IFAPME</td>
<td>CONFÉDÉRATION CONSTRUCTION</td>
<td>BELGIUM</td>
</tr>
<tr>
<td>SATAEDU</td>
<td>--</td>
<td>FINLAND</td>
</tr>
<tr>
<td>CCCA-BTP</td>
<td>FFB</td>
<td>FRANCE</td>
</tr>
<tr>
<td>BZB</td>
<td>ZDB</td>
<td>GERMANY</td>
</tr>
<tr>
<td>BFW-NRW</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AKMI</td>
<td>PEDMEDE</td>
<td>GREECE</td>
</tr>
<tr>
<td>LIT</td>
<td>--</td>
<td>IRELAND</td>
</tr>
<tr>
<td>FORMEDIL</td>
<td>ANCE</td>
<td>ITALY</td>
</tr>
<tr>
<td>VSRC</td>
<td>LSA</td>
<td>LITHUANIA</td>
</tr>
<tr>
<td>CENFIC</td>
<td>--</td>
<td>PORTUGAL</td>
</tr>
<tr>
<td>SCKR</td>
<td>CCIS CCBMIS</td>
<td>SLOVENIA</td>
</tr>
<tr>
<td></td>
<td>BUDOWLANI (TRADE UNION)</td>
<td>POLAND</td>
</tr>
</tbody>
</table>

**EU SECTORAL REPRESENTATIVES**

FIEC

EFBWW

EBC

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 5
2. Methodology 6
3. Description of the construction industry per country & statistics 7
4. Key areas of intervention 28
5. Skill gaps and training needs 44
6. Barriers 51
7. References 58
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 brings together 3 EU sectorial organizations, along with 9 national sectorial representatives and 12 Vocational and Education Training providers from 12 EU countries, all of which have worked together 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 the skills provided.

The following activities will be developed during the project:

- Collecting good practices at national and regional levels to illustrate and promote other initiatives that address skill gaps.
- Collecting information on the construction industry (economic and innovative aspects, changes affecting the sector, occupation, skill gaps and trends)
- Designing and delivering a MOOC to raise awareness among construction workers about new skill drivers: digitalisation, energy efficiency and the circular economy.
- Creating a tool to provide valuable information about the evolution of skill needs at regional, national and transnational levels.
- Revising professional profiles and qualifications in the construction sector in each country involved.
- Carrying out an outreach campaign for the Construction industry to promote its attractiveness among young people and women, identifying solutions to facilitate mobility in Europe.
- Communicating and disseminating the project results, including 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 and led by Formedil (Italy) and Sataedu (Finland), the partners took part in the elaboration of three different tasks aiming at collecting information on the elements that can contribute to shaping a first approach to set up a Sectorial Skills Strategy.

The first step is PESTLE analysis to define the Political, Economic, Social, Technological, Legal and Environmental factors which may affect skills in the sector. The second step is to examine the Status Quo, to set the scene and the state of play of the construction industry in the countries involved. The design of a Sectorial Skills Strategy for the industry is the third step, which will include a Strategic Action Plan and Roadmap to be deployed during the time period of the Blueprint and beyond its finalization.

This document focuses on preparation of the status quo report, with the aim of analysing the current situation of the construction industry in the contributing countries. This analysis will be used as a background for the preparation of the Sectoral Skills Strategy.

The purpose is to identify the major trends at European level, in order to bring about the development of a methodological framework for a prospective study of trades and training at European level.
All partners, with the exception of Portugal and Poland, have contributed to the preparation of the status quo report, providing their input on the following topics:

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

Formedil, the leader of this task, has 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 and Spain). The project partners that have contributed to the realization of this description are vocational training centres, some of which responded with the collaboration of employers’ associations.
3. DESCRIPTION OF THE CONSTRUCTION INDUSTRY PER COUNTRY & STATISTICS

BELGIUM

In Belgium, the 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) of which 5.3% of added value is represented by the Belgian construction industry.

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

<table>
<thead>
<tr>
<th>Construction in the Belgian economy in 2018</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Employees</strong></td>
</tr>
<tr>
<td>6.9%</td>
</tr>
</tbody>
</table>

Sources: ONSS, INASTI, ICN and SPF Economy

*GDP excl. Taxes

Nevertheless, the number of construction companies is increasing significantly in Belgium. According to data from 2018, there are 17 large construction companies (with more than 500 employees), 3,976 SMEs (with from 499 to 11 employees) and 108,489 micro-companies (fewer than 10 employees). This increase mainly consists of companies without staff, as the number of employees in construction remains fairly stable. In the last 5 years, the number of self-employed workers and helpers has increased significantly in construction, reaching 72,200 people in the second quarter of 2019. After a difficult period that lasted some years, salaried employment in construction once again increased by 278,600 (salaried and self-employed) workers in 2019. In addition, a relevant datum to highlight is that unemployment figures remain constant at 5.4%. In addition, it should be mentioned that of the total number of employees in the sector, just 16,808 are women, amounting to 8.4% of the sector.

1. Economic contribution to the GDP, number of workers and construction companies, number of women and migrants working in the sector, forecasts etc.
2. Institute for National Accounts – STATBEL
3. Ibid
4. Ibid
In 2018, the value of construction work totalled EUR 47 billion. Residential construction accounted for about half (47%), non-residential construction was 36% while civil engineering accounted for 17%.

**Construction industry in Belgium - 2018**

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 2020.

**Finland**

The construction industry is the foundation of Finnish well-being and competitiveness. Finland’s GDP is approximately EUR 234 billion in 2018, of which the contribution of the construction industry is approximately EUR 14 billion, that is, 6%. Nearly three-quarters of Finland’s national wealth is therefore tied to buildings, thoroughfares, and networks. The value of construction output in 2018 totaled 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 industry.

The number of workers employed in the construction sector is about 175,000 – 185,000. This figures includes employees in building construction, infrastructure construction and special contracting, as well as officials and entrepreneurs. Of these, civil engineering, i.e. infrastructure construction, directly employs from 45,000 to 50,000 workers. In addition, the construction products industry employs about 80,000 workers. In greater detail, of the total number of construction workers, 8.6% are women and approximately 20% are foreign workers. 25% of these workers are under 30 years old, 55% are aged from 30 to 55 years and 15% are more than 55 years old.

---

5. Euroconstruct
6. Confederation of Finnish Construction Industry RT (CFCI RT)
7. Ibid
8. Ibid- Statistics Finland / CFCI RT
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 women⁹.

In Finland, the annual financial cost corresponding to the need for the renovation of residential buildings in 2016–2025 amounts to EUR 9.4 billion. Approximately 70% of the need for repair corresponds to the 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.

---

The need for renovation of residential buildings in 2016–2025

- **70%**: For repair of parts due to wear, aging and damage
- **23%**: Annual repair or start-up maintenance
- **7%**: Repairing moisture damage and improving accessibility

---

⁹ Construction Unemployment Fund
France

According to the figures published by the FFB in May 2019, the building 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 2018.10

### Size of Construction Companies

<table>
<thead>
<tr>
<th>Size of Construction Companies</th>
<th>0-10 empl.</th>
<th>11-50 empl.</th>
<th>51-200 empl.</th>
<th>More than 200 empl.</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Companies</td>
<td>373,000</td>
<td>19,500</td>
<td>1,300</td>
<td>200</td>
<td>394,000</td>
</tr>
<tr>
<td>Employees</td>
<td>437,000</td>
<td>360,000</td>
<td>149,000</td>
<td>158,000</td>
<td>1,104,000</td>
</tr>
<tr>
<td>Production France (Billion €)</td>
<td>50</td>
<td>45</td>
<td>22</td>
<td>23</td>
<td>140</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Number of Companies</th>
<th>94.7%</th>
<th>4.9%</th>
<th>0.3%</th>
<th>0.1%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employees</td>
<td>39.6%</td>
<td>32.6%</td>
<td>13.5%</td>
<td>14.3%</td>
<td>100%</td>
</tr>
<tr>
<td>Production France (Billion €)</td>
<td>35.7%</td>
<td>32.1%</td>
<td>15.7%</td>
<td>16.4%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: FFB, May 2019

### Breakdown per Professional Category

- Workers: 70.8%
- Intermediate employments, incl. Administration: 20.8%
- Managers and Researchers: 8.4%

### Breakdown of Employees per Activity

- Structural works: 32.5%
- Second and Finishing Works: 67.5%

Of the salaried employees, women represent 12.3% of the workforce. They are mainly in administrative jobs (78%), although their share of management and research jobs has tended to increase slightly since 2000 (from 8.3% to 13.2% in 2018)10.

Additionally, the Public works sector (i.e. infrastructure) as distinct from the Building sector in France includes 8,000 companies with 300,000 salaried employees. It had a total turnover of EUR 41 billion in 2018.11

In 201912 the Building sector produced EUR 140 billion and it represented almost 6% of the EUR 2,346 billion French GDP.

10. *Les indicateurs sociaux du Bâtiment – FFB (June 2019)*
11. *FNTP (Fédération Nationale des Travaux Publics) figures*
12. *INSEE (Statistical Research institute) and FFB*
In the French economy the Building sector is half the size of industry and is twice the size of the banking and insurance sectors. Of the EUR 140 billion it produces, new building construction represents 45% of activity and the maintenance and renovation of buildings accounts for the remaining 55%.

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

Compared to 2018, business and micro-enterprise start-ups continued to grow strongly in the first quarter of 2019, with failures returning to low levels.\(^\text{13}\). Since 2010 investment in the German construction sector has increased by 100%. Construction companies are investing more than the rest of the economy.

The drivers of this development are sustainable demand for residential construction and the expansion of public infrastructure. Demand in the residential construction segment resulted from continued internal migration to metropolitan areas.

The construction sector is now one of the most important pillars of the Germany economy, whose nominal GDP totalled EUR 3,388 billion in 2018. Construction activities amount to 5.34% of Gross Value Added (GVA) in Germany or 10.4% of nominal GDP.\(^\text{14}\). The sector is interlinked with many others and is also closely linked to a

\(^{13}\) The French Construction and Public Works Observatory
\(^{14}\) _p. 11 et seq._
variety of trades. It is transdisciplinary as it affects areas that are economically and societally very important. Among other aspects energy efficiency, climate protection, the circular economy, digitalisation and the training of skilled professionals in a wide range of disciplines should be mentioned. 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. The main drivers for the boom are housing construction and public contracting/procurement for infrastructure projects, as well as commercial housing and the energy-efficiency restoration of the building stock.

Nearly two million people are employed in Germany in the construction sector, including enterprise owners, co-owners and apprentices. Only 13% of the construction workforce are women, 50% of whom work part time. 5.6% of Germany’s entire workforce is employed in construction, 18% of workers are foreigners and the average age of workers is 43 years old. In 2018 nominal construction volume amounted to EUR 400 billion. The main construction trades (MCT) include about 75,000 active enterprises, while the finishing trades (FT) includes about 252,000 active enterprises. In the FT as well as in the MCT SMEs predominate: more than 90% of enterprises in both sub-sectors have less than 20 employees. Gross fixed capital formation amounts to EUR 352 billion, and housing drives investment. For 2019, estimations forecast growth of more than 7%. This trend will continue with an estimated annual growth rate of more than 6%.

Important figures (2018, in Euros) for the Country are:

- Overall construction volume: 400 billion.
- Housing: 230 billion, of which 73 billion is for new housing and 157 billion for the current building stock.
- Commercial, industrial and agricultural construction: 81 billion is for building construction and 34 billion for civil engineering.
- Public sector: 21 billion building construction, 34 billion civil engineering.
Women remain underrepresented in construction. Their share amounts to 13% (240,318) of the workforce while roughly half of them only work in part time jobs in construction. This is mainly office work rather than manual labour.

In 2018 18% of the employees in the construction sector were foreigners.

The average age in building construction is 43 years old.

For the year 2019, the ZDB expects turnover in the construction industry to grow by +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 demand is now also proliferating in suburban areas. The good employment situation in the national economy and low financing costs continue to strongly support demand. Approximately 300,000 to 310,000 residential units in the years 2019 and 2020 respectively are expected to be completed. Development is aided 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 ambivalent. While the leading indicator of “building permits” already points to a slowdown in investment, 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). This increase is appropriate in view of existing deficits, although it is also ambitious on the part of the public sector, as well as in the implementation of projects by the construction industry.

Prospects for business in the year 2020 are generally good. 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 under discussion since 2011, and it has to be implemented if the goals of the climate protection program are to be achieved. On the other hand, assessments of the economic outlook of the German industry are subdued, with rising wages and materials costs as well as the continuing shortage of labour, giving reason to assume that growth in the construction industry is slowing down.

Even if the momentum of sales growth slows down somewhat, the construction industry will still be a driver of growth in the German economy.
The construction sector in Greece grew rapidly from the early 1990s to 2007, significantly increasing its influence on the Greek economy and positively contributing to its growth. However, the adverse macroeconomic conditions and fiscal adjustment in recent years had a dramatic effect on the industry. Falling 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 been very negative for the finances of the Greek construction industry.

The current capacity of the industry in terms of human resources, capital equipment and know-how has fallen. Many companies (technical companies, manufacturing and marketing companies for construction products and materials, design offices etc) either shut down or are working below capacity. The shrinking of investment in Greece, which mostly affects the construction sector, triggered but also largely expressed the deep recession that the Greek economy has undergone in 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 by much more than other fixed capital investments. This is mainly due to the share of investment for the construction of new houses, which collapsed (from EUR 25.2 billion in 2007 to EUR 1.2 billion in 2018), together with less investment in other construction work, which 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 which could encourage a major recovery of the construction sector, as well as maximising its contribution to the reconstruction of the national economy. Although in the medium term it would be unreasonable for several reasons to expect a recovery of investment in housing to the same level as in the past, it is clear that, compared to other European economies, the lack of economic activity and employment in the sector, as well as in other related industries, means that without a significant strengthening of construction activity it will not be 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 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, there are significantly fewer civil engineering firms (8% of the total).

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

The rest of the construction sector kept (as a whole) losses to the same level, thus maintaining its relatively stable share of GDP (3.2% of GDP in 2017, down from 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. Although construction work declined over the same period in the EU28m it did so to a lesser extent than in Greece. More specifically, in 2017, it stood at 8.8% of GDP, down from 10.5% of GDP in 2007, with the building industry dropping slightly more than the rest of the construction sector.
The share of employment in the building sector decreased from 8.1% in 2007 to 4.9% in 2017, while other sectors of the Construction sector remained relatively stable in terms of total employment. More recent data state that the total number of construction workers was 151,600 in 2018\(^{20}\).

Other relevant data in the industry are that 9,099 women were working in the sector in 2018\(^{21}\) which means that only 6% of the total workers in the sector are women. In addition, 2% of the total number of workers in the industry are migrants from other Member States and around 17% come from third countries\(^{22}\).

\(^{20}\) More information [here](https://www.statistics.gr/en/statistics/-/publication/SJO03/-
\(^{21}\) https://www.statistics.gr/en/statistics/-/publication/SJO03/-
\(^{22}\) https://www.statistics.gr/en/statistics/-/publication/SJO03/-
IRELAND

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

In Ireland, in 2018 added value in the Construction sector recorded 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 GDP\(^23\) in the 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 almost twice the Eurozone average.

<table>
<thead>
<tr>
<th>-CONSTRUCTION OUTPUT 2013-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>------</td>
</tr>
<tr>
<td>Value of output at current prices (€m)</td>
</tr>
<tr>
<td>Change in value of output(%)</td>
</tr>
<tr>
<td>Construction output as % of GNP</td>
</tr>
</tbody>
</table>

The construction industry is seeing commercial office space, office fit-outs, 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 a growing population. The level of activity in the construction sector as a whole 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.

\(^23\) Central Statistics Office CSO; Quarter 4 2018 and Year 2018 (Preliminary); Mar 2019
Year-on-year change in 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. 7,909 new dwellings were completed in the first half of 2018, 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 are still skill 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.

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

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Development of building projects</td>
<td>2,416</td>
<td>3,749</td>
<td>3,222</td>
<td>3,042</td>
<td>2,850</td>
<td>2,741</td>
<td>2,482</td>
<td>2,753</td>
<td>2,887</td>
</tr>
<tr>
<td>Construction of residential and non-residential buildings</td>
<td>13,876</td>
<td>13,269</td>
<td>12,143</td>
<td>11,515</td>
<td>11,221</td>
<td>10,996</td>
<td>10,633</td>
<td>11,089</td>
<td>11,193</td>
</tr>
<tr>
<td>Construction of roads and railways</td>
<td>1,027</td>
<td>884</td>
<td>802</td>
<td>719</td>
<td>689</td>
<td>670</td>
<td>680</td>
<td>697</td>
<td></td>
</tr>
<tr>
<td>Construction of utility projects</td>
<td>322</td>
<td>316</td>
<td>283</td>
<td>270</td>
<td>257</td>
<td>268</td>
<td>266</td>
<td>276</td>
<td>275</td>
</tr>
<tr>
<td>Construction of other civil engineering projects</td>
<td>381</td>
<td>376</td>
<td>310</td>
<td>299</td>
<td>316</td>
<td>335</td>
<td>358</td>
<td>405</td>
<td>432</td>
</tr>
<tr>
<td>Demolition and site preparation</td>
<td>766</td>
<td>719</td>
<td>649</td>
<td>607</td>
<td>594</td>
<td>561</td>
<td>547</td>
<td>595</td>
<td></td>
</tr>
<tr>
<td>Electrical, plumbing and other installation activities</td>
<td>11,337</td>
<td>11,111</td>
<td>11,046</td>
<td>11,141</td>
<td>11,139</td>
<td>10,930</td>
<td>10,495</td>
<td>10,861</td>
<td>10,845</td>
</tr>
<tr>
<td>Building completion and finishing</td>
<td>22,163</td>
<td>18,973</td>
<td>17,112</td>
<td>16,157</td>
<td>16,063</td>
<td>15,737</td>
<td>15,683</td>
<td>17,051</td>
<td>17,337</td>
</tr>
<tr>
<td>Other specialised construction activities</td>
<td>9,617</td>
<td>8,075</td>
<td>7,040</td>
<td>6,486</td>
<td>6,371</td>
<td>6,246</td>
<td>6,215</td>
<td>6,858</td>
<td>7,307</td>
</tr>
<tr>
<td><strong>Construction total</strong></td>
<td>61,905</td>
<td>57,472</td>
<td>52,607</td>
<td>50,256</td>
<td>49,530</td>
<td>48,502</td>
<td>47,349</td>
<td>50,546</td>
<td>51,568</td>
</tr>
</tbody>
</table>

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

---

The figures provided by the Central Statistics Office CSO (2nd Quarter 2019), Labour Force Survey confirm that the total number of workers engaged in the construction sector (NACE F- General classification of economic activities in the European Communities) stands at 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 workers, and women represented 11,200 of the workforce in Q2 2019, compared to 6,700 in Q2 2016 (CSO). This amounts to an increase of 60%, with non-nationals making up XX% of the workforce.
65% of these workers are in specialised construction activities (e.g. bricklaying, scaffolding, construction equipment hire), 28% work in building construction, 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 in the future. Indeed, the expansion of the industry is predicted to require 76,000 more 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 a low level of qualifications, a percentage almost half of the EU-28 average26.

**ITALY**

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

Nevertheless, investments in the sector significantly contribute 7.9% to the Italian GDP of EUR 1,765,421 million (2018)27, and, due to its long and complex supply chain which connects the construction sector to over 80% of other economic sectors, its growth could allow the GDP of the country to recover half a percentage point per year and align its growth to that of other EU Member States over the short-term.

On the other hand, and according to 2017 data, in Italy there are about 500,000 construction companies, of which 1177 are large companies (with more than 50 employees), 18,168 are SMEs (with from 10 to 49 employees) and 49,968 are micro enterprises (with fewer than 9 employees)28. These companies employ around 800,000 workers, of whom 80% are older than 35 years old29. In addition, just 6.5% of all these workers are women, and 17.2% are immigrants.

There is also a clear dominance of employed workers in the sector, at 61%, while the remaining workers are self-employed.

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

The estimate by the National Association of Italian Constructors (ANCE) for total construction investment in 2018 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 and it lost almost 600,000 jobs. More than 120,000 companies were driven out of the construction market, and total investment in the sector fell by 35.1% after 2008. More specifically, new housebuilding declined by 66.1%, non-residential building by 27.3% and civil engineering by 54.1%.

The ANCE outlook for 2019 is positive, and it envisions a 2% increase in overall construction production levels in real terms.

---

26. More information [here](#).
27. Istat
28. Ibid
29. Ibid
The expected positive trend will be driven by continued growth in the redevelopment of the existing housing stock 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 overall construction activity, as compared to 19.9% in the pre-crisis years, keeps its pace of growth (+20.9% Year-on-Year in 2018). This is partially due to the stimulus effect of the tax relief programme, which offers a 55% tax rebate for redevelopment and requalification, and a 65% tax rebate for energy efficiency works on the housing stock. ANCE affirms that investment in housebuilding increased in 2018 (1.2% year-on-year in real terms), which is also due to a recovery in new housebuilding investment (+3% year-on-year in real terms). 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, investment in redevelopment of the existing housing stock continues its positive trend (+0.5%). In 2018, private investment 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.

**Lithuania**

The construction sector in Lithuania is pro-cyclical, so the cycle of growth is due to end. Worsening global growth and the likely slowdown in major neighbouring economies will affect Lithuanian construction companies. However, the real estate price is still rising. 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 –investment and consumption. Recently, construction-related investment, such as 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 added value created in the construction sector accounted for approximately 16% of overall economic growth (usually this sector generates about 7% of the total added value).

Although the construction industry was strongly affected by the economic crisis of 2008-2009, it has been recovering and growing ever since. It increased by 55% from 2010 to 2017, from EUR 1.56 billion to EUR 2.84 billion, but it is still below 2008 figures (EUR 3.66 billion).
Labour productivity (Gross value added per hour worked, at current prices) in the construction sector has shown an upward trend, from 2016: EUR 11,300 to 2017 – EUR 13,100.

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

Construction mainly involved non-residential buildings -EUR 1.1 billion, or 36.6% of total work in the country. Civil engineering work amounted to EUR 1.3 billion or 44.5% of total work in the country. Compared with 2017, the volume of work increased by 17.5 per cent.

The number of employees in the construction sector reached 102,600 in 2018 and the number of workers employed in the sector increased by 3.6% (up from 99,000 thousand in 2017). Of this total of employees, only 10,200 are female. The sector accounted for 7.5% of total employment in the country. (Total Employment – 1,368 million, and industrial employment (incl. construction) amounted to 348,85 thousand). 51,700 immigrants are employed in Lithuania, 33,400 of them in the industrial sector.

More than half (52.3%) of the total work carried out involved the construction of new buildings, while 20.1% was reconstruction and 19.9% was renovation.

At the start of 2019, 8,778 companies were operating in the construction sector, a slight 3% increase % compared to 2018 (8,511). 48% of these companies specialize in the construction of buildings. Small and micro enterprises (with no more than 49 employees) predominate in the sector.
Construction grew intensively for the third consecutive year in Slovenia, making an important economic contribution to current national GDP of EUR 45.7 billion (2018)\(^{31}\).

Construction enterprises in Slovenia had a turnover of almost EUR 6 billion in 2018, which is still almost 30% less than it was in 2008, but also 34% more than in 2013. The largest share of turnover (over 49%) in 2018 corresponded to specialized construction activity, followed by the construction of buildings at almost 30% and lastly civil engineering, at 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 downwards in the near future\(^{32}\).

Statistical Office of the Republic of Slovenia (SURS) statistics for the first nine months of 2019 indicate continuous growth in the volume of construction work, despite the less optimistic expectations at the end of last year. After 19.8% growth in construction last year, this year (2019), in the first nine months, 6.2% growth was recorded in comparison with the same period last year. The most intensive growth was recorded by CCI-construction craft and engineering works (7.2%), slightly smaller buildings (3.7%), while 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 profits in 2018 than in 2017, while the other 13 activities increased in 2018.

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

### Employed by Year. Slovenia, Sex- Total, Construction, Number (in 1000).

![Graph showing employment in construction by year.](image)

Source: Statistical Office of Republic Slovenia

---

\(^{31}\) Eurostat

\(^{32}\) More information [here](#)
Approximately 80% of the construction market corresponds to companies and 20% self-employed workers.

In 2018 there were 19,220 construction companies with a total of 60,282 employees, as was shown in December 2018 on the basis of on taxes paid, where 5,333 are women and 2,067 are migrants from member states. In addition, 21,392, (36.6%) are foreign (from third countries) and 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%). Only 11% of employees had higher education.

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

Due to the crisis and recession in the period from 2008-2013 approximately 34,000 jobs out of a total of 87,947 were lost (employees left the sector and many even left the country). The unemployment rate now stands at 5.1% in Slovenia.

---

<table>
<thead>
<tr>
<th>EDUCATIONAL ATTAINMENT</th>
<th>BASIC OR LESS</th>
<th>UPPER SECONDARY</th>
<th>TERTIARY</th>
<th>UNKNOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>total</td>
<td>total</td>
<td>total</td>
<td>total</td>
<td>total</td>
</tr>
<tr>
<td>SEX*</td>
<td>SEX*</td>
<td>SEX*</td>
<td>SEX*</td>
<td>SEX*</td>
</tr>
<tr>
<td>MEN</td>
<td>MEN</td>
<td>MEN</td>
<td>MEN</td>
<td>MEN</td>
</tr>
<tr>
<td>WOMEN</td>
<td>WOMEN</td>
<td>WOMEN</td>
<td>WOMEN</td>
<td>WOMEN</td>
</tr>
</tbody>
</table>

33. More information [here](#)
Spain

Construction has been, and still is, a relevant leading sector in the social and economic modernization of the country, contributing to its development, its territorial cohesion and the well-being of its citizens. Its production used to represent more than 18% of Gross Domestic Product (GDP) (currently 11.15% of Gross Fixed Capital Formation) and employ more than 2,500,000 workers (currently 1,253,489). We can therefore affirm that construction is the most important economic sector in Spain along with tourism, due to its contribution to GDP and job creation, its ability to stimulate other industries and its image.

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

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2017</th>
<th>Inter-annual variation 2018/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gross Domestic Product (Million €)</strong></td>
<td>1,206,878</td>
<td>1,166,319</td>
<td>3.48%</td>
</tr>
<tr>
<td><strong>Gross Value Added Construction Industry</strong></td>
<td>70,472</td>
<td>64,751</td>
<td>8.84%</td>
</tr>
<tr>
<td>% Gross Value Added CON. / GDP</td>
<td>5.84%</td>
<td>5.55%</td>
<td>5.18%</td>
</tr>
<tr>
<td><strong>Gross Fixed Capital Formation Construction (Million €)</strong></td>
<td>129,793</td>
<td>119,758</td>
<td>8.38%</td>
</tr>
<tr>
<td><strong>GFCF Construction Dwellings (Million €)</strong></td>
<td>67,676</td>
<td>61,082</td>
<td>10.80%</td>
</tr>
<tr>
<td><strong>GFCF Construction other Buildings and Constructions (Million €)</strong></td>
<td>62,117</td>
<td>58,676</td>
<td>5.86%</td>
</tr>
<tr>
<td>% GFCF Construction / GDP</td>
<td>10.75%</td>
<td>10.27%</td>
<td>4.74%</td>
</tr>
</tbody>
</table>

Source: INE

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

<table>
<thead>
<tr>
<th></th>
<th>2.018</th>
<th>2.008</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>New Dwellings</strong></td>
<td>100,733</td>
<td>264,795</td>
</tr>
<tr>
<td><strong>Renovations</strong></td>
<td>28,066</td>
<td>34,756</td>
</tr>
<tr>
<td><strong>Finished Dwellings</strong></td>
<td>64,354</td>
<td>615,072</td>
</tr>
</tbody>
</table>

The sector has an atomized business structure, in which 98.7% of the total companies that is, 402,923, are SMEs. Construction companies in Spain:
In 2018, the number of employees in the sector was 1,221,800 according to the data of the Survey of the National Institute of Statistics, up by 8.3% with respect to the previous year.

<table>
<thead>
<tr>
<th></th>
<th>2018</th>
<th>2017</th>
<th>Variation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Employed</td>
<td>1,221.8</td>
<td>1,128.3</td>
<td>8.3%</td>
</tr>
<tr>
<td>Under 30 years old</td>
<td>106.1</td>
<td>98.8</td>
<td>7.4%</td>
</tr>
<tr>
<td>Between 30 - 59 years old</td>
<td>1,046.8</td>
<td>962.3</td>
<td>8.8%</td>
</tr>
<tr>
<td>More than 60 years old</td>
<td>68.9</td>
<td>67.2</td>
<td>2.5%</td>
</tr>
<tr>
<td>Women (percentage)</td>
<td>8.7</td>
<td>8.8</td>
<td>-0.9%</td>
</tr>
<tr>
<td>Foreigners</td>
<td>15.8</td>
<td>14.7</td>
<td>7.5%</td>
</tr>
<tr>
<td>Unemployment (percentage)</td>
<td>9.9</td>
<td>11.7</td>
<td>-15.7%</td>
</tr>
<tr>
<td>Unemployed</td>
<td>134.8</td>
<td>150.3</td>
<td>-10.3%</td>
</tr>
</tbody>
</table>

Source: DIRCE

The sector continues to age. In 2018, there were 7.4% fewer workers under 30 years old, which means that only 9% of workers in the sector are under 30 years old. Ten years ago, 42% of workers were under 34 in the sector%, while in 2018 that percentage is only 19%.
Conclusions

The construction industry is a very important sector for European countries, and it is a key segment in terms of GDP and employment. It was shown that all the countries participating in the project suffered in the crisis during the years 2008-2015. However, in every country, the construction sector has experienced growth over the latest years. The countries where the sector is growing the most are Ireland and Slovenia. However, in other countries such as 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 the main figures are34:

▼ 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 the EU, amounting to 43.7% of gross fixed capital formation and 9% of total GPD.

▼ The construction industry employed a total of 14,818,000 people in the EU.

▼ The number of construction enterprises totalled 3,332,000 in the EU, where 95% of them have fewer than 20 workers.

A more recent overview of the state-of-play of the construction industry in Europe, in September 2019 compared with August 2019, showed seasonally adjusted production in the sector increased by 0.7% in the euro area (EA19) and by 0.3% in EU28 countries, according to the 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 EU28 countries. In September 2019 compared with September 2018, production in construction decreased by 0.7% in the euro area and increased by 0.3% in EU28 countries35.

34. More information here
35. More information here
4. KEY AREAS OF INTERVENTION

4.1. DIGITALISATION

**Belgium**

The Confederation Construction carried out a survey of its members before its Construction Forum 2017\(^\text{36}\). According to this survey, digitalisation is not yet widespread; in fact only 30% of entrepreneurs answered that they know the new digital technologies. Only 5% of companies use them and of all the companies that use these technologies, 90% believe that digitalisation is inevitable. The majority of non-users of digital technology do not show any interest in it and believe they will be able to do without them. Large construction companies are the ones that seem to be moving faster and more easily towards the digital market.

**Finland**

In recent years, the promotion of digitalisation has been part of the government’s key Action Plan in the Real Estate and the construction sector. One example is the implementation of the KIRA-digi aid, which provided funding for new experimental projects in 2016–2018: so far a total of EUR 3.4 million has been given to more than 100 experiments\(^\text{37}\). The success of state-funded pilot projects and the creation of a digital community in the industry are good signs. The results are estimated to generate benefits of 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 innovations 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 major 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 management methods;
- Facilitating the co-financing of hardware, software, qualification and consulting;

\(^\text{36} \) _La construction numérique, balises pour une transition réussie – Rapport annuel 2016-2017 – Confédération Construction_

\(^\text{37} \) _More information [here]_(Note: Insert correct link if available)
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 and ICT initiatives in all sectors, including the construction sector, are included in the country’s National Digital Strategy. The first priority of this is to deploy New Generation Access (NGA) network infrastructures such as the EuroAsia Interconnector, linking the electricity systems of Israel, Cyprus and Greece and including fibre-optic cables.

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

**Germany**

Work coordination and material management, transport and installation in the construction industry could all be improved by digitalisation. BIM-tools and best-practise examples show how work processes can be improved. Technologies have yet to be developed, and to promote their use some national initiatives have been organized. As example is the Competence Centre for Digital Crafts\(^\text{38}\), which aims to inform employers in the construction industry about the use of digital technologies, supporting them in the practical implementation of these tools in their companies, 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 made by the Construction IT Alliance (CitA) that has promoted the benefits of digitalisation in the construction and engineering industry in Ireland, with BIM dominating its initiatives. A survey conducted by NBS CitA\(^\text{39}\) in 2019 assessing Ireland’s current BIM maturity stated that large construction companies have embraced BIM whereas SMEs have not or, if they have, are only using basic 2D BIM (stage 2) programmes in the design phase. This is due to the lack of interest and cost problems.

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. However, there are still conflicting opinions in the industry about BIM as to its suitability and use in Lean Construction.

---

\(^{38}\) [More information here](#)

\(^{39}\) [More information here](#)
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 costing EUR 100 million or more, and its final application will be progressively implemented over 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 progressive introduction by the contracting authorities, the granting administrations and the economic operators. It deals with the obligatory nature of specific technological methods and instruments, such as BIM and infrastructure work during the design, construction and management of works and 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 costing over EUR 50 million; from 2021 for complex works costing over EUR 15 million;
- From 2022 for works over €5.2 million; from 2023 for works costing over €1 million;
- From 2025 for all new works.

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

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

LITHUANIA

In order to coordinate digitalisation of the construction industry, the Public institution “Skaitmenine statyba” (“Digital Construction”) was established in 2014. This organization brings together Lithuanian construction sector associations and coordinates the digitalisation process in the Lithuanian construction industry. “Digital Construction” is the process of creating and promoting unified requirements for BIM. The single construction information classification system will be continuously developed. Moreover, international data transfer formats will be introduced. BIM related standards will also 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 digitalise and automate various construction processes bound together in a complex relationship, thereby optimizing operations.
The Public “Digital Construction” institution, together with the 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 competency roles, etc. that are available for construction market participants.

**SLOVENIA**

In 2015 a non-formal BIM association called SiBIM was created. The BIM Association of Slovenia (siBIM) is a voluntary, independent and not-for-profit organisation that connects engineers and engineering enthusiasts, who use or would like to use BIM in the building 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 cooperate with SiBIM. In 2018 SiBIM prepared the digitalisation action plan for construction; however, one year later the political parties have not been able to commit to it.

Nowadays, there is a need to digitalise 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 business organization and procurement of public works services. In order to meet the challenges ahead in 2018 the CCIS established the Construction Investment Academy, which enables students already in employment to acquire advanced skills related to construction investment, communication skills and creative thinking. This course covers 7 themes and lasts for 7 full days. Module no. 4, with a duration of 8 hours of classes, 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 some years now. However, for small companies nothing has been done to encourage the use of BIM, with the exemption of the Architectural Chamber of Slovenia (ZAPS) which 2019 organized the 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 the BIM model for public infrastructure.

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

In VET schools BIM and digitalisation are generally being introduced more slowly, and teaching staff are less interested in using them (or do not know how to use) this advanced and still developing technology. They also lack appropriate software licences to train the students in their 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 use.

---

40. More information [here](#).
41. More information [here](#).
42. More information [here](#) and [here](#).
Spain

The construction industry is adapting to new technologies. Labour productivity is increasing and will be further enhanced once new digital technologies are widely adopted.

BIM technology makes project planning more effective. It is easy to implement and manages the different activities in a Project, although starting to use BIM is quite complex. In 2018, 55% of the companies in Spain had rolled-out a BIM project, but it has to be stressed that only 15% use BIM as a general method for all projects\textsuperscript{43}. In order to be successful, companies emphasise that before starting BIM implementation, it is necessary to generate a clear, concise and realistic integration plan, adjusted to the needs of the organisation. It is remarkable that 37% of companies consider that BIM is not a priority and they do not receive any pressure to use it from the sector.

On the other hand, Initiatives such as ES.Bim\textsuperscript{44}, by the Ministry of Development, which integrates all of the interested parties (administration, engineering, companies, universities and professionals,...) are essential to promote the use of BIM in the professional and academic fields. BuildingSMART Spanish Chapter is also relevant. This non-profit association has the main aim of fostering efficiency in the sector through the use of open standards of interoperability in BIM, to reach new levels regarding cost reduction, execution time and quality enhancement.

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. Most especially for SMEs and in order to elaborate uniform rules to reduce complexity, it is crucial to harmonise building codes and standards at national level; to update building codes and standards regularly; to standardize and digitalise 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.

\textsuperscript{43} More information\textsuperscript{here}
\textsuperscript{44} More information\textsuperscript{here}
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 digitalisation of the industry could be achieved by combining BIM with the other technologies already mentioned.

Based on the national reports it could be said that the EU construction industry is not digitalising at the same pace as other industries, which are adapting to technological challenges faster. Although efforts are being made by EU Member States in order to achieve EU requirements, through national initiatives, more stress should be placed on digitalisation by national authorities when implementing their Action Plans.

Updating workers’ digital tool skills within the construction industry is also mentioned by some countries in their reports. Effective digitalisation training programmes should be introduced in national training systems in order to ensure that workers’ skills are fit-for-purpose.

In addition, it was stated that there is hardly any demand for digital tools in some construction companies, mainly SMEs. Consequently, the promotion of the use of these tools as well as their multiple cost-efficiency benefits should be encouraged.
4.2. THE CIRCULAR ECONOMY

**Belgium**

In March 2016, in Belgium, the Brussels Capital Region adopted a Regional Program for the 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 jobs. Construction is one of the priority sectors identified by the Regional Plan for the Circular Economy of Brussels. The needs are to prolong the lifecycle of buildings (maintenance, monitoring, and renovation) and to use construction resources in an efficient way (notably reusing construction materials).

At the end of 2011 the principles of sustainable materials management and the circular economy were fixed in Flemish legislation through adoption of the Materials Decree. To facilitate the transition towards a circular economy, The Public Waste Agency of Flanders—OVAM 45 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 educational institutions, industry, civil society and the government.

**Finland**

A strategic programme for promoting the circular economy is being prepared for Finland. We aim for a transformation into a new economy that is founded on the circular economy. By means of 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 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 for 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.

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 and reaching a 65% rate by 2025 for recycling so-called

---

45. More Information [here](#)
non-hazardous waste. Moreover, the construction sector is largely covered by new legislation to be adopted in early 2020 on waste management and the circular economy. Among other aspects, this law aims to improve construction waste collection and intensify the use of waste tracking to avoid illegal dumping. Moreover, it will encourage the recycling and reuse of construction waste and the eco-design of construction products.

**Germany**

Germany implemented several laws to support the 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 this law is to promote the circular economy in order to save natural resources and to protect the environment as well as people. The overarching principle of this 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 for thermal power 5. Waste disposal. Besides the Circular Economy Law, another important step was the Packaging Regulation, which was replaced in 2019 by the Packaging Law. This intends to reduce the unfavourable effects of packaging waste on the environment and to increase recycling rates. One important clause of the law is the obligatory deposit for single use beverage containers. It obliges retailers to take 0.25 Euro from customers for each single use container as a deposit, which is then repaid when customers bring back the beverage containers. The return rate exceeds 95% and littering has been reduced to “very low” levels 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 has grown continually since 2005, with waste stemming from construction as the major driver, as the following figures underline. 411.5 million tons of waste was 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 results 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 construction industry waste. 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 of in an environmentally friendly way. Therefore, construction waste was fed back into the material cycle. 95% of the mineral waste used for road building was recycled as construction material.

**Greece**

Regarding the circular economy, the framework for public and private construction projects has been adapted by the Ministry of Energy. However, a National Road Map for the Circular Economy is still being prepared to align the legislative framework with European directives. The circular economy aims to recycle or re-use secondary materials and waste as productive resources and useful materials, adding a sustainable dimension to the productive model.

Moreover, the completion of Regional Planning/Plans, the use of RDF in the Cement Industry and Compost in agricultural production are indicative areas of the circular economy which the country has centred on.
IRELAND

The Irish Green Building Council (IGBC) emphasis the urgency to assess low carbon, healthy, responsible products for the construction sector. Important steps towards a circular economy in construction have already been implemented by the 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 information on the impact of the products which can be used in building Life Cycle Assessment or embodied carbon calculations.

ITALY

In Italy, it is considered essential to invest in skills and to encourage companies to take environmental aspects into account such as energy efficiency, the circular economy and pollution. Therefore, we need a plan for the circular economy in the 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, the circular economy is not only a technological problem as it is also a regulatory one. The procedures for waste recycling are too complex and are 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 the circular economy, and it leads companies to create waste instead of recycling it. Incentives should be given to those who reuse materials and reduce the impact of their construction sites. If we want to promote the circular economy, the investment risk for companies and territories must be reduced.

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

SLOVENIA

The circular economy has been a predominant and important topic in the Slovenian economy. Innovations were boosted by following circular economy principles. Over the years, many European projects led by key sectorial employer stakeholders (GZS – the Slovenian Chamber of Commerce, ZAG – the Slovenian National Building and Civil Engineering Institute, GI ZRMK – the Building and Civil Engineering Institute, OZS the Chamber of Craft and Small Business of Slovenia ...) have focused on developing new business models, introducing the concept of the circular economy and creating added value for the construction sector. Although construction raw materials are nowadays still much cheaper and are widely available, problems arise when recycling them. Moreover, using recycled materials more cannot be expected to occur in the short-term, so external incentives or mandatory rules are needed to change this situation.
Basically, the 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 the circular economy concept also depends very much on a change in mind-set. For many years, sustainability has been perceived to lead to increased costs rather than adding any value. Beyond the construction phase, building maintenance, management and decommissioning are vital in incorporating circular economy principles. New recycled construction materials have been produced, and in comparison 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, and construction is one of the priority sectors for implementing this transition. Thus the National Plan for Waste Management (PEMAR) 2016-2022 sets objectives and guidelines to improve the quality of recycled materials and to encourage their use.

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

The circular economy requires continuous learning, a flexible approach, analysis and the measurement of results, together with collaboration.

It is important to educate and train all the professionals who work in the construction sector on the principles of the circular economy. To this extent, it is considered necessary to encourage training programs to include this type of criteria, principles and concepts, and there is also the need to organize specialized recycling courses adapted to each professional sector.

**Conclusions**

In every country analysed, the circular economy is considered to be one of the main drivers for 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 national data is not always available respecting waste production.

In some countries there is de facto evidence of right steps already taken. For instance, in Germany there is the Circular Economy Law, which mainly focuses on waste management from the beginning of the process until the end. Such management is also contemplated in other national initiatives, with a high rate of construction material recycling in Lithuania and Spain, for example.

Nevertheless, there is common acknowledgement of a lack of specific skills for the circular economy within the construction sector. Waste management training should be introduced in 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 from 2002 to 2015 thanks to measures taken to improve the energy efficiency of buildings and particularly insulation.

Overall, the consumption of gas, oil, coal and heating decreased from 2002 to 2015. However, the consumption of electricity increased from 1.58Mtoe to 1.62Mtoe for residential buildings. The main reason for this increase is more intensive use of electricity-consuming appliances, such as IT devices.

The increase in overall consumption of energy which is a consequence of the growing number of dwellings is more than offset by the decrease of average energy consumption in residential buildings achieved thanks to financial incentives and 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 into account in sustainable construction and the rational use of energy.

In Finland energy-efficiency agreements in the property and building sector have resulted in increased energy efficiency. These agreements cover a significant part of the private service sector and state-owned buildings. Improved energy efficiency plays a key role in the practical implementation of companies’ environmental and social responsibilities. Finnish housing energy consumption decreased by 7.7% from 2010 to 2018.

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

FRANCE

In France, the “Thermal regulation” (RT) sets energy consumption standards for 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 necessary condition to benefit from public support for energy-efficiency renovation projects. Households wishing to proceed with an energy refurbishment and gain access for example to a 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. electricity production by private individuals and its purchase by certified companies. In 2017 the Agency for Environment and Energy Management (ADEME) published 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 accounts for 1/3 of 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 for sustainable construction which is binding for federal buildings, considering ecological, economic, sociocultural and technical aspects, and it 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 on energy efficiency and energy-saving advice for professionals in the construction industry.

**Greece**

In terms of energy efficiency, the EPRD Directive for improving the energy efficiency of the European building stock has been enacted by national law N.3661/2008. The “Regulation on the Energy Performance of Buildings – KENAK” outlines the general calculation that is in accordance with European standards. Some government policies have the aim of implementing more environmentally friendly practices, although due to the economic crisis, the rejuvenation of the building stock is proceeding slowly. One of the main long-term goals in the country (2030) is the creation and promotion of Manuals for improving energy efficiency in production procedures.

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, 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 their environmental impact and increase the durability and recyclability of their components. Working methods should also aim to minimize negative environmental effects and increase recycling.
IRELAND

The Climate Action Plan was published in 2019, with significant outputs regarding energy efficiency and life cycle certification. 54% of Irish organisations participating in the World Green Building Trends 2018 SmartMarket Report expect their projects to be green by 2021⁴⁷. 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 the 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 building types must by law comply with the NZEB standard as of November 2019. A number of courses to train consultants and trades people in NZEB construction are underway at HEI and VET levels. These include: NZEB professional consultant, NZEB professional design consultant, NZEB craftworkers (plasterers, carpenters, electricians, plumbers and bricklayers), NZEB for ventilation installers, NZEB for Site Supervisors/Foremen, NZEB for construction workers and the Environmental Certificate for Professionals.

ITALY

In Italy, as in other countries, European directives have been transposed into law. In particular, this happened with 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 insulation thickness and minimum distances between buildings, and with 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 works through three instruments:

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

2. The national action plan for buildings with almost zero energy: from 2021 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 a share of 17% of energy from renewables in gross final consumption and 10% for transport in 2020. In addition, minimum environmental criteria have been established. The main financial instruments, mainly relating to buildings in the residential and tertiary sectors, are as follows:

⁴⁶ W. Green Building; World Green Building Trends 2018 - Smart market report; 2018.
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 it was the lowest of the three Baltic States at 205 kgoe/1000 EUR (in Latvia – 207 kgoe/1000 EUR, Estonia – 358 kgoe/1000 EUR). Lithuania still lags behind (by about 70%) the EU average (120 kgoe/1000 EUR).

The greatest potential for energy efficiency improvements based on the economic feasibility of effective measures is in the industrial, building and transport sectors. The construction sector’s contribution to energy efficiency is very high. 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 it obligatory for all new buildings to be A+ class, and from 2019 all new public buildings must be A++ nearly zero-energy buildings.
Slovenia


Energy efficiency in building is especially supported by the national ECOFUND and its calls for companies and entrepreneurs to start installing more energy-efficient 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 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. It encourages the deployment of the necessary infrastructure for e-mobility, and introduces an intelligence indicator to assess the technological aspects of buildings.

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


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 Plan\(^\text{48}\) defines what Spain must do until 2030 to achieve energy efficiency (32.5%) and Renewable Energy (40%) targets in line with European Union commitments.

\(^\text{48}\) More information [here](#)
Conclusions

Energy efficiency is other new skills driver in the construction industry. Many European initiatives are being developed that stress the need for continuous 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 to implement these.

In all partner countries courses are being organized and carried out for consultants, technicians and workers in the construction of nZEB and energy efficiency, although all of them have identified a lack of qualified professionals, consultants and workers in this field.
5. SKILL GAPS AND TRAINING NEEDS

**Belgium**

A study carried out by the Belgian foundation for vocational training in the construction industry, the Belgian Building Research Institute and Regional Energy Agency estimated that 33,400 workers will need training on energy efficiency and Renewable Energy sources in the construction sector by 2020. The study also highlighted the slow rate at which training programmes are adapted to technical evolutions in the construction industry. A stronger link between industry and training providers could help to remedy this failing.

To overcome the lack of skilled workers, the social partners of the construction sectors have agreed on a bonus system for students in construction-related training. 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 course can get up to 1500€ in bonuses.

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

**Finland**

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

For wood construction and CLT technology related expertise has given rise to new demands.

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

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

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.
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 it clear that qualifications appear to be necessary in the following areas:

- **Digitalisation**

- **Energy efficiency**

- **Occupational health and safety**

- **Green Skills**

In addition, it was emphasised that there is a “mismatch” between occupations and personal qualifications, so that data analysis programmes should be developed, as in the example of Detecta 49, in order to balance supply and demand throughout Europe. With regard to the databases, Build up Skills (BUS) 50 also pointed out that a database related to the construction industry is still missing.

49. More information here

50. More information here
In particular:

- In the SkillCo project\(^1\), the skill gaps in the four areas will be addressed at EQF level 4.
- In the BUS project, 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**

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

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 key IT–based technology that is expanding its influence throughout the industry is Building Information Modelling (BIM).
- Using and combining materials in building construction is also evolving along with innovation in the sector, and 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 factory-built before being transported. This means that there is less need for trades people 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 raises 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 “green” materials and techniques.

\(^{51}\) More information [here](#)
The energy sector will also be a major driver of demand for specific skill sets of construction workers. With its aging energy infrastructure Greece will need major investment to build, retrofit or decommission its power plants. Construction workers’ skills will be of major importance as most power plants were built decades ago, and know-how related to steel-fixing or building of large concrete structures that require specific endurance and durability is often not easy to find.

**IRELAND**

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 trades people.

- Skill gaps have emerged across the whole range of construction trades and are most pronounced in the “wet” trades (e.g. plastering). The shortage is so severe that there is the potential for long term problems to arise, such as is the case of Floor and Wall Tiling, where no new apprentices have registered in recent 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, 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 training. A number of NZEB programmes have been adopted by educational training boards to upskill existing craftworkers, and it is envisaged that these will be included in the next adaptations of the apprenticeships, e.g., the Joinery apprenticeship is currently being reviewed to include NZEB requirements.

**ITALY**

In the construction sector, economic studies should be analyzed in order to make a census of unemployed workers who need to be trained. It is also necessary to retrain sector workers in specific skills and integrate them with the collaboration of bilateral sectorial bodies which provides companies with the instruments to improve worker skills.
It is now crucial that VET providers and enterprises take on specific roles in minimizing skill shortages and ensuring high quality training services for the construction sector. Our training schools work closely with companies and social partners in order to guarantee fulfilment of quality and training needs.

The key skills and competences related to digitalisation and technologies in the construction sector will therefore require specific professional figures, such as: materials technologists who researches and studies, using chemical, physical and mechanical methods, structures and properties of materials and their interaction with the environment; Project Managers, who evaluate and appropriately manage the risks associated with a project, managing resources and integrating all business processes, making a detailed analysis of the benefits of controlling project quality and maximizing its yield; finally, Data Analysts collect data from different market sources, organizing and structuring them before analysing them to obtain useful information for the business of their 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 sites. In this way, VET should be an experimental setting rather than a passive teaching technique, in a more effective and participatory type of education.

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 increase the awareness of public decision-makers, and it would be necessary to give greater support to consumers in order to encourage companies to take into account environmental aspects such as energy efficiency, the circular economy and pollution in their production processes.

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

**Lithuania**

In Lithuania, construction workers, bricklayers and professionals in the furniture industry rank among the professions with the 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)), welders, mechanics, engineers, electricians, painters, locksmiths, fitters, millers, tailors, trimmers, plastic moulding specialists and production assistance workers were also in high demand in 2017. These shortages are primarily linked to the fact that by emigrating construction workers enjoy better working conditions and higher pay. The shortage of construction workers, as well as other skilled manual workers, is also affected by a limited amount of young people undertaking VET and as a consequence of the 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 the energy-efficiency of buildings, even though no official data is available on the number of workers who have already trained for this. Nevertheless, according to a survey conducted among construction companies, it is reported that about 40% of workers have received training in the energy efficient construction of buildings, while 30% have been trained 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+ to develop effective training schemes.

**Slovenia**

Special skills training related to energy efficiency and the construction sector has been made available over recent years by many EU initiatives (BUILD UP SKILLS, ERASMUS+, LIFE+) in which organizations from Slovenia participated. However, new legislative requirements for energy performance, green public procurement or in relation to national ECO FUND open calls on renovation lead to new needs.

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 in these, and participation in these courses more or less depends on companies’ aims, strategies and the 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, and specific modules were only added to the VET curriculum. This is a very common proceeding since the Slovenian VET system 3-6 NQF level has some specific characteristics, e.g., it makes an open curriculum possible, and approximately 20% of lessons are able to focus on different topics, according to sector needs or pupils’ tendencies.

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

**Spain**

Due to the economic, structural and social barriers in the Construction Industry in Spain it is necessary to provide training in order to fill the gaps in workers’ qualifications. The new tendencies make an efficient and flexible response for training necessary in several fields such as BIM methodology, industrialized construction or sustainable building. According to the Status Quo analysis\(^{53}\), ten building occupations are the most important in Energy Efficiency (EE) and Renewable Energy Systems (EERR) with major needs for training: operator for sealing joints, assembler of aluminium and PVC carpentry, installer of thermal solar installations, bricklayer, installer of heat generation systems: geothermal systems, 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 report would be carpentry and PVC aluminium, exterior enclosures, roofs: insulation, partition walls: insulation, ACS and air-conditioning installations, Plumbing installations, gas installations, electricity generation equipment and electrical installations.

---

53. More information [here](#)
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; 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 makes greater energy efficiency more necessary. 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 that in the partner countries:

- There are not enough qualified craftsmen.
- Skills gaps exist in all building trades.
- There is a lack of candidates for apprenticeship.

Each country agrees that in order to overcome these obstacles they should develop training actions that are more closely related to the specific economic activity in question, in particular to increase the number of workers with medium and high skill qualifications.

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

Sector skill gaps could be identified in the main areas of working:

- ICT- Digitalisation, for example BIM.
- Green and ecological working, for example Energy efficiency, renewable energy systems, wood construction, recycling, new materials and the reuse of construction waste.
- Safety and Healthy at work especially important for the new emerging risks in green construction activities and digitalisation work.
- Soft skills such as communication among workers or team work are required.
6. **BARRIERS**

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

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

6.1. **POLITICAL / LEGISLATIVE BARRIERS**

The main political barrier which is faced by the construction industry in Belgium is the lack of measures taken by the government to overcome the labour shortage. Special attention must be paid to activating and retraining workers for undermanned occupations. Besides, high labour costs make Belgian companies less competitive in the international market.

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

In **France** there is a real need for investment 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 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 hindrance to the development of the sector is tendering and awarding public works. Excessive discounts in competitive tendering 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 out the problems in the public works procurement system. Strengthening construction activity can only arise by 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 and legislative obligations that are too burdensome.

---

54. Economic, administrative, structural, educational, cultural
In **Italy**, there is no specific national law on urban regeneration, but only local laws. For this reason national coordination is necessary, a control room to make the sector develop without hindering important growth initiatives. There is a lack of specific measures to effectively implement urban regeneration through the renovation of energy-intensive buildings. This national situation causes other problems linked to loss of employment in the sector.

In **Lithuania**, the digitalisation of the construction industry is also interlinked with the whole life-cycle phases of construction projects as well inspection and maintenance, which are facing new challenges related to the adoption of new rules and regulations (Legislative issues). In general Lithuania is slow to start and adopt digital construction regulations. Nevertheless, new digital initiatives lack political support, which will become a key issue in the upcoming years. Moreover, the three environmental aspects of energy efficiency, the circular economy and pollution are very important for companies in their production processes. Energy efficiency is in first place as it is important in the renovation of apartment blocks and public buildings. Moreover, recycling and waste management are also very important, as it the circular economy.

In **Slovenia**, changing the legislation is complex and 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. To achieve 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 a poorer economy and slow 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 BARRIERS

In **Belgium**, a high VAT rate for demolition and reconstruction work hinders the renovation of existing buildings. A national VAT rate of 6% for demolition works would boost renovation works and improve the 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 were made to increase VET funding, the population is aging rapidly and the birth rate is falling. Also, the availability of labour is falling and economic conditions are worsening.

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

Economic barriers could be found in Germany when considering the digitalisation of some work processes. Established work routines are replaced by new methods and technologies must be learned first in order to function smoothly.

In **Germany**, it is difficult 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) statistics, over 70% of employees with a degree leave the industry after 5 years at the latest.

In **Greece**, the fall in bank financing and household income are problems, but the high taxes on real estate have also had a significant impact.

In **Ireland**, skill gaps have emerged across the whole range of construction trades and are most pronounced in the “wet” trades (e.g. plastering). The shortage is so severe that there is the potential for long-term problems, such as is the case of floor and wall tiling, where no new apprentices have been registered in recent years, mainly due to its image of being dirty heavy work.

In **Italy**, a strong contraction of credit in the construction sector prevents any strengthening of corporate organizations. The workforce is also limited in terms of availability and quality. Companies with a low level of innovation are an obstacle to the professional growth of workers. In addition, the recycling of demolition waste is too expensive and to date there has been no national decree for the implementation of demolition and construction waste management to end waste. This leads the sector’s operators to manage such materials as waste and not to recycle them. There are companies that try to operate in a sustainable way, despite the legislative barriers, but there are no national incentives and simplified bureaucracy to support them.

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

55. More information [here](#)
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 and unattractive jobs which worsen the image of the industry. Moreover, it also reduces the interest of young people in joining the sector, resulting in a lack of staff in the labor market and an aging workforce in the sector. Two major barriers can be identified: a lack of capital and executive capacity – over the everyday and short term - and a need for companies to work in the black economy to achieve liquidity.

In Spain, the economic crisis damaged the sector and it is still recovering. There is also a lack of qualified work force, with high migration rates and ageing workers.
6.3. STRUCTURAL BARRIERS

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

In **France** the trade/craft based organisation of the construction industry will be challenged in the coming years, due to new environmental, organisational, technological and other changes. 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** is set to implement several structural reforms in order to tackle new challenges in this rapidly changing world. Some of them such as Education reform (Education for future), Tax reform, reform to combat the shadow economy, innovation reform (Lithuania does not fulfil its potential in science to develop new products, and it has set the goal of promoting 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 is no single standardized process to digitalise all of the companies in the construction industry. Structural barriers also exist in terms of mobility. Some companies and construction sites are located in areas that are difficult to reach by public transport. Consequently, digitalisation could help to make data access easier for workers and employees, working at home or at other building sites. This way travel costs could be saved and work-life balance could be optimized.

In **Italy**, the construction sector is characterized by a very large number of small, unstructured enterprises with no staff training, and for this reason a European strategic plan for innovation and the financing of training is indispensable.

In **Slovenia**, the sector has to be transformed with new business models, price policies and career opportunities.

In **Spain**, the vast majority of construction companies are SMEs. It is therefore in SMEs where the real need for training lies. This is mainly because the relationship between company size and training activities is directly proportional: workers in a SME find it harder to access training than it is for workers in large companies, which usually have a training plan.
6.4. EDUCATIONAL BARRIERS

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 the hierarchical structure of education, with strong control by the Ministry of Education. Teacher training is a big challenge and may become a barrier to training new skills. However, the SME sector expects trainers to take the initiative and, on the other hand, it also expects the public sector to invest in training workers.

However, from the beginning of 2018 vocational education reform\textsuperscript{56} will come into force in Finland, and this 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 learning\textsuperscript{57}. The purpose is to alleviate skill shortages and 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 lower the status of the latter group. This culture is deeply entrenched and shared by families and teachers, making it difficult 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 the public authorities and social partners.

In Germany, school preparation in the MINT (mathematics, engineering, natural sciences and technology) occupations would have to be improved in terms of training and spatial perception (visual thinking). For example young students need to be able to imagine what 1 Cubic metre looks like in practice. In 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.

The existence of non-statutory professional rights seems to play a rather significant role in attracting the interest of young people to vocational training for specific specialities. It is characteristic that when the construction sector in Greece in the previous decade was highly developed, the relevant specialities were underrepresented in vocational Lyceums due to the lack of regulated professional rights for medium and low-level craftsmen, despite the fact that these professions require high levels of 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 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 the co-ordination of the existing fragmented VET provision, strengthening the institutional framework of governance, the regulation of training and qualification standards and increased funding. Some changes are starting to emerge in this area.

\textsuperscript{56} More information \textcolor{red}{here}

\textsuperscript{57} More information \textcolor{red}{here}
In **Italy** higher education and vocational schools need to be more flexible to serve businesses and satisfy 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 properly train new workers. It is fundamental to have a training plan to create new skills and develop existing ones to constantly update workers, especially regarding technological evolution.

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

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

Many skilled workers are looking for other jobs, mainly in equipment procurement, in other sectors or even abroad. Nevertheless, some companies have already reported that they were unable to find proper (skilled) workers for work they have won in tenders, and had to train the ones who applied for these jobs.

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

**Belgium**

- Build Up Skills Belgium – Analysis of the national status
- Confederation Construction Annual Report 2018
- Euroconstruct
- Institute for National Accounts – STATBEL
- **La construction numérique, balises pour une transition réussie – Rapport annuel 2016-2017 – Confédération Construction**
- Tendances et innovations dans la construction – Etude CEFORA in collaboration with KU Leuven

**Finland**

- Confederation of Finnish Construction Industry RT (CFCI RT)
- Construction Unemployment Fund

tyy-viela-miljoona-euroa-jaossa-uusille-digikokeiluille

- **The Confederation of Finnish Construction Industries RT** - [https://www.rakennustekollektiivi.fi/English/Frontpage/](https://www.rakennustekollektiivi.fi/English/Frontpage/)
- **University of Tampere** - [https://www.tuni.fi/en](https://www.tuni.fi/en)
- **VTT TECHNICAL RESEARCH CENTRE OF FINLAND LTD** - [https://www.vttresearch.com/](https://www.vttresearch.com/)

**GERMANY**

- **BBSR (2019) - Bericht zur Lage und Perspektive der Bauwirtschaft 2019, p. 4**
- **BBSR (2019) - Bericht zur Lage und Perspektive der Bauwirtschaft 2019, p. 2**
- **Build up skill Germany Status Quo reports 1-3**
- **Bundesagentur für Arbeit (2019) – Der Arbeitsmarkt in Deutschland 2018, p. 162**
- **Bundesverband Baustoffe – Steine und Erden e.V. –**
- **CODESMA project (circular economy/waste management)** - [http://www.codesma.eu/](http://www.codesma.eu/)


http://www.e-decta.eu/web/

https://www.skillco.eu/content/news/

https://www.soka-bau.de/

Kompetenzzentrum Digitales Handwerk - https://handwerkdigital.de/

Statistisches Bundesamt

Statistisches Bundesamt (2019): Bruttoinlandsprodukt 2018 für Deutschland

Talents4Construction project - https://www.talents4construction.de/en-gb/home

Tyco(o)nstructor project (transversal skills development) - https://tycon-project.eu/index.php/sample-page/

UBA 2010: Bewertung der Verpackungsverordnung – Evaluierung der Pfandpflicht

WinAPP project (digitalisation in initial VET) - https://sites.google.com/site/winappcpd/


Greece


Ireland

Cedefop – 2018 & 2019 skills forecast

CIF, DIT; Trades & apprenticeships skills survey; Feb 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
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

ITALY

- Cresme - [http://www.cresme.it/](http://www.cresme.it/)
- [https://www.istat.it/](https://www.istat.it/)

LITHUANIA

- CEDEFOP REFERNET Lithuania: VET in Europe reports
- Enterprise Lithuania, www.verslilietuva.lt/lt/analitika/
National Energy Independence Strategy of the Republic of Lithuania [link]

SKILLS FOR JOBS - LITHUANIA, OECD 2018 [link]

Statistics Lithuania, Building construction [link]

The World Bank, Group, Doing Business 2019 [link]

SLOVENIA

Eurostat [link]

http://ecommerce.sist.si/catalog/tc_search.aspx?tc=769b749d-5f38-4366-99e6-c45dd79c40bb

http://sibim.si/en/


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

SPAIN


Final circular Economy package, European Commission [link]


IDAE website, Gobierno de España. Ministerio para la Transición Ecológica. [link]

Observatorio de la Fundación Laboral de la Construcción, Informe sobre el Sector de la Construcción 2018 [link]

Plan nacional integrado de energía y clima 2021-2030 [link]

Sustainable building communication, European Commission [link]