Secondary sources : articles, reports, …

1. COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT AND THE COUNCIL: Strategy for the sustainable competitiveness of the construction sector and its enterprises

REPORTS AND STUDIES: Eurostat		
URL	• https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2012:0433:FIN	
URL information	• The final version	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	This communication goes out from the European Commission, and describes the importance, the challenges and the strategy for the European construction sector.	

- Pre-analysis

The communication starts with the importance of the construction industry for the European economy. In numbers and in impact on the life of the EU-citizens. Therefore the competitiveness of the enterprises is an important issue. The construction sector plays an important role in the delivery of the Europe 2020 Strategy on smart, sustainable and inclusive growth: renovation of the buildings and infrastructure. Furthermore, higher energy efficiency in new and existing buildings is key for the transformation of the EU's energy system.

After denominating the strategic importance of the sector, communication identifies the main challenges that the sector faces today and up to 2020 in terms of investment, human capital, environmental requirements, regulation and access to markets, and proposes initiatives to support the sector for this purpose.

Diagnosis
The markets of the EU construction sector and the sector itself are highly fragmented, with many micro-enterprises, large differences between Member States in the performance of the sector and considerable difficulty in spreading good practices. Better value-chain integration would significantly increase the scope for spill-over innovation effects from collaboration.
As announced in the recast of the Energy Performance of Buildings Directive, the introduction of Nearly Zero Energy Buildings (NZEB) is going to be a major challenge for the construction sector. The transition to a resource-efficient and low-carbon economy will also bring important structural changes in the construction sector, which will have to adapt and anticipate the needs for skills and competences in these areas.

The industry is developing more and more materials that are easier to collect and reuse and systems or 'building solutions' that facilitate the 'deconstruction' of the works and the re-use of materials.
It is necessary to better anticipate future skills and qualification needs, to attract a sufficient number of students to relevant construction professions and to create the conditions for a better working environment and career management, for a greater mobility of construction workers and for wider provision of cross-border services.

European Strategy
This strategy focuses on five key objectives:

(a) stimulating favourable investment conditions;
(b) improving the human-capital basis of the construction sector;
(c) improving resource efficiency, environmental performance and business opportunities; (d) strengthening the Internal Market for construction;
(e) fostering the global competitive position of EU construction enterprises.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
Percentage of Accessibility		18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic	Job market	X

situation	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	X
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

The text states that the construction sector will go under many changes in the ears to come. It doesn't give a lot useful information for the big data software, but it is a critical starting point: Europe shapes the future of the European Construction sector.

- Circular economy
- Zero emission houses
- Investments in infrastructure
- Lack of low skilled workers
- Need to anticipate the formation

the text gives the text a summary of the challenges that lie ahead: shortfall of skilled workers, low attractiveness to young people, limited capacity for innovation, undeclared work, recovery from the hard hit by the financial and economic crisis, increased competition from non-European operators inside and outside the EU-borders, achieving the EU's climate, energy and environmental objectives will require significant, changes that will be difficult for the sector to tackle without appropriate policy support

- Interesting links

CEN Construction Network / JRC's guide to Life Cycle Thinking and Assessment / SuperBuildings and Open House / **reFINE** (research for FutureInfrastructure Networks in Europe)

2. Trends en innovaties in de bouwsector – Cevora

REPORTS AND STUDIES: Eurostat	
URL	• https://www.cevora.be/Portals/0/Documents/Sectoren/Studie%20-%20Trends%20en%20innovaties%20in%20de%20bouwsector.pdf

Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The emphasis is on the changes and evolutions, today and in the near future, of the building sector. These evolutions will require innovation. In short, the focus of this research is on innovating in the construction sector and the consequences for the employee occupations. We mainly focus on Flemish construction companies, but also pay attention to the situation regarding Wallonia.	

- Pre-analysis

- Transformation construction sector
  - The number of white-collar workers is rising rapidly (more and more shortage occupations), while the number of workers is constantly falling. This has consequences for the provision of additional training courses
- The sector has a role to play in the economic, socio-cultural, political and technological evolutions that take place.
  - More and more, the construction is socializing
  - The added value is to be find in the way one produces, the customer focus, the speed of building, the materials used to build or the technologies used
  - too many suppliers of production capacity are with a one-sided focus on cost reduction.This prevents innovation
  - The transition that the construction sector will undergo can best be described as the evolution from a fragmented production market to a process-based, integrated services market in function of social added value.
- Interviews and literature all point in the direction of chain cooperation as process innovation
  - Now still in the start-up phase
- Under the influence of lean (where executive personnel has more autonomy), BIM and standardization (prefabrication in the fabric instead of on the site), many functions in the construction sector will change, disappear or see the light.
  - In terms of safety and health this has positive consequences, but in terms of employment and autonomy, the expectations are unclear.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	9	10%
	Percentage of Accessibility	19	20%
Frequency and	Frequency	0	10%

update	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	8	10%
	Systematisation	7	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	10	15%
Percentage of completeness		10	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%
Total		59	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	X
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

More and more involved actors, stricter (legal) requirements, changing financing models, shrinking margins, demanding customers and stricter technical standards. The construction sector is evolving, and the

evolution will require more and more cooperation between building partners (architects, engineers, building companies, project leaders, blue and white collar workers, ... Digitization and ICT are the major facilitator for these evolutions (e.g. Buiding Information Management (BIM) and lean building).

Also product innovations play an important role. Safety, weight, strength and functionality are important factors in the development of new products. However, the main role is reserved for the sustainability of materials and techniques.

Another trend is standardisation of the building process. It is very likely that the standardization of processes and products will continue in the future. But also in terms of organization, a certain degree of standardization in the processes can be realized through sustainable partnerships.

Technology is the great facilitator in all those innovations. Through technology it becomes possible to produce much more accurately and efficiently. And this is no longer at the expense of customization. Robots, drones or 3D printers are highly flexible devices that can be used in the construction industry with the right algorithms. Technology facilitates but is no guarantee of success. Technological innovation requires social innovation.

The number of purely executive employees will steadily decline as technology becomes smarter and faster. This is compensated by an increase in the number of employees in the construction sector due to an increasing need for management, maintenance and control functions. But there is a threat of creating a dual labour market with, on the one hand, the well-paid and highly trained coordinators and managers, and on the other hand, the - often foreign - executive and low-paid staff, who are also getting more and more competition from technological alternatives.

The construction sector is extremely fragmented and is involved in a tough competition. The availability of cheap, foreign workers is another brake on innovation: as long as the costs for labour remain so low, companies have little pressure to innovate.

3. Les métiers en 2022

REPORTS AND STUDIES: Eurostat		
URL	• https://dares.travail-emploi.gouv.fr/dares-etudes-et-statistiques/etudes-et-syntheses/synthese-stat-synthese-eval/article/les-metiers-en-2022	
URL information	• the document has to be downloaded	
Typology	Statistics	X
	Bibliographic	
	Statement	X
Resume	Since the end of the nineties, France Stratégie has been regularly conducted to examine the prospects for changes in manpower and labor per occupation. These exercises are led by France Stratégie, in collaboration with the management of research, studies and statistics (DARES). The current exercise concentrates on the prospect of professions and qualifications	

	until 2022. It differs from the previous one, in particular because it is based on three scenarios that make it possible to assess the effects per profession, taking into account macroeconomic and sectoral developments. . This in a particularly uncertain economic context. This section provides a general overview of employment and vacancies per business line until 2022. For each of the 19 professional fields, the changes in employment are described in the occupations it consists of, leave at the end of their careers and vacancies by 2022 and the characteristics of the employees.

- Pre-analysis

The main evolution of employment is that it will increase but it results that this increase will be a consequence of a high leave rate among workers "at the end of their career". Plus, the tertiarization will continue.

Three scenarios are established: the central tends to be neutral about the unexpected behaviours of the economy, the target scenario is ambitious and the crisis scenario is the most pessimist. The central scenario takes in account two things: first, the recovery capacities of the economy of the different sectors and second, the structural modifications already engaged influencing the productivity and the employment evolution. The crisis scenario imagines a lower economic growth due to irrecuperable loss because of the crisis (investment, innovation, human capital) and a decrease in the global demand. The target scenario imagines a productivity rebound of the French economy based on a strategy of investment and innovation within a normative and fiscal context that facilitates the outbreak of new activities linked to environment and the articulation of services and industry.

The need of qualified labourers in the construction sector (in the three scenarios) would continue increasing this would be the result of the population growth in the country, of the refurbishment of buildings and adaptation of building lots to an aging population and to dependency, of the development of regulatory and environmental norms. However, the job creation would be lower than the last decade. The qualified labourers in the "second structural work" (electricians, painters, plumbers, carpenters…) would relatively be affected by the leave "at the end of career" of workers (mainly self-employed).

Table of prospective on employment per professional fields including construction as part of the PMQ (prospective on employment and qualifications).

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	9	10%
	Percentage of Accessibility	19	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%

Percentage of frequency and update		0	25%
Rigour	Origin and impact	8	10%
	Systematisation	8	10%
Percentage of rigour		16	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		70	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

According to the central scenario, the creation of employment would mainly affect the technicians, supervisors and managers. Also the low-qualified labourers but they could represent a high entry potential for higher occupations through training. In the "second structural work" field, one out of four low-qualified

worker is a trainee. If the employment creation vary according to the three different scenarios, it shows positive rates in all three cases.

Regarding the leave "at the end of career", it will be higher among qualified labourers (40% of self-employed) than among the low-qualified labourers where there is a turn-over phenomenon. However, we can see in all professional fields in the construction sector that workers stop early their career as a "at the end of career" leave due to uncomfortable working conditions, physical conditions, higher risks, etc.

The turn-over effect will play a key role in the employment creation when the leave of workers is linked to hard working conditions and to the transition of workers to a more qualified occupation. The employment creation would affect mostly low-qualified workers and especially workers in structural work, public works and concrete.

The evolution of the sector will need a higher qualification from workless labourers due to environmental laws, the increasing use of ITC and the adaptation of the relational competencies. The qualifications at the beginning of the employment will increase and underlies a big challenge in training opportunities for the next decade. Plus, the workers profile in the sector remains mainly men-only. Even though there is an increase in the female rate in the very qualified occupations such as architects and managers, they remain very few among the labourers. The rates of foreign manpower working in the construction sector is still very high being three times higher than in the total employed population.

Nothing about the digitalisation

4. Deteccion necesidades formativas

REPORTS AND STUDIES: Eurostat		
URL	• https://www.sepe.es/contenidos/que_es_el_sepe/observatorio/pdf/DETECCION_NECESIDADES_FORMATIVAS_2017.pdf	
Typology	Statistics	X
	Bibliographic	
	Statement	X
Resume	… The report talks about a reform that has been passed about the Law 30/2015. The reform is about the setting up of a Professional Training System for the Employment. The system will be applied for all Spain. The reform aims to overcome some needs and priorities of both companies and workers in a competitive context with increased needs of qualifications. These needs are due to the aging of the active population, the coexistence of high rates of unemployment and the lack of qualified labor supply in some sectors or in emerging occupations demanding high innovative skills, and the increase of long-term collective unemployment.	

- Pre-analysis

The reform should be able

1) to improve the companies competitivity, the workers employment and
2) to treat efficiently the incompatibility between qualified supply and work demand.

This legitimizes the development of such system to help workers find a job, keep it and go back on the labor market. The reform has four strategic goals:

- the guarantee that the workers (employed and unemployed) keep their right to access these trainings,
- the effective contribution of the trainings to the companies competitivity,
- the collective negotiation enforcement with a qualified labor supply consistent with the productive system requirements and
- the transparence and efficiency in managing public finances.

No information on the impacts of digitalisation

Annex: list of formative needs, of the most representative economic activities per occupation + information about the job market per occupation and its territorial distribution

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	7	10%
Percentage of rigour		17	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		72	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	X

	Economic conjuncture autonomous community, county, municipal	X
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	
	Sectors that generate employment	X
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

ECONOMIC-BUSINESS FRAMEWORK

The general data show that the economic activity shows a positive evolution with an increase of employment of 2,9%, meaning 481.200 new jobs, full-time equivalent.

The two main indicators used by the Labor Public Service are the recruitment (number of contracts) and the unemployment.

In 2016 in Spain there has been an increase in employment (compared to 2015) with a interanual variation of 7,55% showing a consecutive period of increase for the last four years since 2006. This increased has been seen in four different sectors such as Agriculture, manufacturing industry, services and **construction (1.184.904 new recruitments in 2016).** The occupation with most recruitments and with a positive interanual variation are: (…) **bricklayers (387.092),** truck drivers (245.313).

About the unemployment in 2016, it has been decreasing for the last four years with 400.000 unemployed workers less than 2015 which means a decrease of 9,54% (best score for the last decade). The negative interanual variation can be seen in all different sectors, **in the construction sector it has been -17.04% (best score)**.

Best employment sectors and activities

Spain has been trying to recover from the crisis since 2009 and they find that all sectors but the construction sector have now (2016) recovered with a recruitment rate (number of contracts) higher than those in 2009. **The construction sector knows a slower evolution** but they don't explain why. The tendency is positive in both the specialized construction and the construction of buildings.

The construction sector is the one with the less number of affiliated and contracts. It seems that the tendency has been stabilized (same numbers than 2015) even if the numbers are still very far from what they were before the crisis. The sector occupies the fifth place in contracts volume. However the affiliation has increased by a half and is then the sector which has increased the most its number of affiliated in the last year (2015-2016).

The activity with the best behavior is the specialized construction, mostly because of the renovation, even if the construction of buildings has been reactivated in some geographical areas with the increase of new buildings.
The sector is characterized by a high volume of workers as self-employed, mostly in the specialized construction even if the volume is decreasing. The self-employed workers in the construction of buildings represent almost a third of the professional workers in this activity and show a positive evolution.
Identification of the occupations with the best situation in the labor market in 2017 (best situation is defined by some indicators and variables such as the volume of contracts registered per occupation in 2016, the interanual variations of registered contracts, the number of different persons in each occupation…). **Regarding the construction sector**, there is a list of 23, **the 5 top occupations are:** Engineer in construction and civic buildings, electrical engineer, architects, technical architect and electrical technician.

SKILLS SHORTAGE
P.68-72 gives an overview of the formative needs in the construction sector (edification and civil works). **These trainings are related to technical professional skills**: auxiliary techniques, machinery, structure, brick layering, finishing touch and others. **Transversal skills have also been detected**: languages, TIC and informatics, knowledge in finance, juridical and normative knowledge, functioning of public administrations, and other general skills: soft skills, team management, literacy, organisation and planification, social skills.
What will help the rebound of the construction sector are the implementation of the technical code in the construction with criteria's related to the environment, energetical efficiency, sustainable energies. **Some experts state that the future of the construction sector is in prefabricated construction and engineering of buildings, this will create a need in trainings for skills linked to new materials or for safety as they will change the working organisation.**

They insist on the key role of the young workers to replace those that will soon leave. The construction of buildings is the 12th in the list of the economic activities with the highest number of workers affiliated in a social security aged more than 60 years old.
They insist on the need to give trainings to the youngest that would like to start as a self-employed worker.

5. Global construction survey: make it or break it

REPORTS AND STUDIES: Eurostat		
URL	• https://home.kpmg.com/xx/en/home/insights/2017/10/make-it-or-break-it.html	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	We've seen a host of advances in the form of new construction techniques, project delivery strategies, and enhanced processes and controls for safety, risk management, budget, scope and schedule. But the industry's overall performance during this period continues to tell a discouragingly different story, replete with a continued inability to increase productivity, raise	

	performance levels and reduce project failures. Can we make the kind of step change needed to bring performance in line with stakeholder expectations?

- Pre-analysis

The articles sums up the necessary steps to optimise performance, in particular for construction companies. KPMG focuses on three steps to change the way of business:

1. Rationalise governance and controls
2. Innovate with technology
3. Optimise human performance

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	9	10%
	Updating	0	15%
	Percentage of frequency and update	9	25%
Rigour	Origin and impact	8	10%
	Systematisation	8	10%
	Percentage of rigour	16	20%
Completeness	Totality, credibility and representativeness	12	15%
	Percentage of completeness	12	15%
Adequacy	Typology of source	16	20%
	Percentage of adequacy	16	20%
	Total	71	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	

	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	X
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

The articles sums up the necessary steps to optimise performance, in particular for construction companies. KPMG focuses on three steps to change the way of business:

1. Rationalise governance and controls
   It's time to take stock of all your governance, risk and control procedures and assess each one carefully. Once the governance has been assessed, the organization should take a hard look at which controls are missing, which are inadequate, which are 'overbuilt', and which are simply ineffective. And, of course, all controls should be designed with the end user in mind.
2. Innovate with technology
   It's crucial to understand the current state of your organization's data, systems and overall technology, to evaluate where to invest to gain the maximum benefit. One obvious starting point for quick wins is data analytics: finding cost-effective ways to get the most out of the data you already have (much of which sits in your current systems and tools). Equipped with a solid understanding of the current technology position, and having gained momentum with quick wins, the organization can now develop a digital strategy and road map.
3. Optimise human performance
   Targeted communications with different messages (and media) for different groups of employees. Baby Boomers may be more comfortable with a top-down, hierarchical organization, with traditional values. But Gen X and Millennials, expect a more contemporary approach that values sustainability and diversity, and gives individuals more personal freedom. Workforce optimization means utilizing resources effectively, by understanding the capabilities and potential of your high performers, and giving them the platform to build experience and develop fulfilling careers, and addressing issues that could cause them to leave. And finally, workforce analytics is all about improving performance, by understanding how workers collaborate and behave, Workforce optimization means utilizing resources effectively, by understanding capabilities potential your high performers, giving them platform experience develop fulfilling careers, addressing issues could

cause leave. And finally, analytics all about improving performance, how collaborate behave, spotting gaps.: and spotting gaps.

The recommendations have a survey as basis, complemented with (own) research results.

They do not make the link to changing competence and formative needs, nor the link to the economy on macro scale.

6. Information sheet Construction sector

REPORTS AND STUDIES: Eurostat		
URL	• https://www.eurofound.europa.eu/nl/publications/information-sheet/2016/working-conditions-industrial-relations/establishment-characteristics-and-work-practices-construction-sector	
URL information	• Published on 22 December 2016	
Typology	Statistics	X
	Bibliographic	
	Statement	
Resume	This paper is one in a series of sector profiles giving an overview of structural characteristics, work organisation practices, human resource management, employee participation and social dialogue in the construction sector. It is based on the third European Company Survey (ECS). The sector includes all activities related to construction. The third ECS contains responses from 2,014 establishments in this sector across the EU28.	

- Pre-analysis

Figures about

- Establishment type by size: the majority of establishments (87%) in the constructionsector are single establishments
- Years of operation by size: A slightly higher than average proportion of establishments in the construction sector (70%) has been in operation for between 10 and 49 years
- Women, older workers and workers with a university degree:
  - In 78% of construction establishments, less than 20% of workers have a degree, compared to 58% in the EU28 overall.
  - In 75% of construction establishments, less than 20% of the workforce is female
  - The construction sector is less innovative than the EU28 average
- New or improved products, processes and marketing methods and organisational change: There are large differences regarding innovative activities in terms of size
- Collaboration and outsourcing: In the moderate type, the majority of establishments are not involved in any form of design or development (93%), the production of goods and services (71%) or sales and marketing (67%).
- Internal organisation and information management: Work is more likely to be organised in teams in the construction sector than on average. In 42% of establishments, most employees work in a single team, compared to 32% in the EU28

- Decision-making on daily tasks: As compared to the EU28 average, the planning and execution of daily tasks in the construction sector is more frequently decided by managers or supervisors (70%compared to 54%)
- Recruitment, employment and change: In 30% of construction firms, the number of employees actually decreased between 2010 and 2013, compared to 24% in EU28 establishments. The group is characterised by an extremely high proportion of establishments that had difficulties in finding skilled employees (88%)
- Training: in the construction sector, 75% of establishments offer time off for training – at least to some of their employees (EU28 71%).
- Working time flexibility: Flexibility in starting and finishing time is not offered in 44% of establishments, compared to 35% across the EU.+
- Variable pay: Differences between the sector and the EU overall average are marginal as regards variable pay schemes
- Workplace social dialogue: The ECS 2013 shows that an official structure of employee representation is present in 29% of establishments in the construction sector, a little lower than in the EU28.

■ Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%
Frequency and update	Frequency	7	10%
	Updating	10	15%
	Percentage of frequency and update	17	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
	Percentage of rigour	20	20%
Completeness	Totality, credibility and representativeness	15	15%
	Percentage of completeness	15	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	92	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

The article gives figures about structural characteristics, work organisation practices, human resource management and direct employee participation and social dialogue in the construction sector. There is no link to employment needs, evolutions in the sector, differences between countries and subsectors, …
The most recent ECT survey dates from 2013 (the sector reports came available in 2016). The next survey is planned in 2019.

7. Final report of the ESCO skills mapping pilot

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/esco/resources//escopedia/20181010_150824/657260c3-3f9d-4b0a-b093-bb3589808676Skills_mapping_pilot_report.pdf	
Typology	Statistics	
	Bibliographic	
	Statement	X

Resume	This report tries to test the ESCO classification in pilot projects set up by the European Commission, such as a mapping pilot for mapping skills classifications. It compares the skills classifications of CV and JV from Austria and Sweden to the ESCO skills classifications in order to check the relevance of its classifications. They used both blue- and white-collar workers but not from the construction sector.

- Pre-analysis

Detailed methodology of the skills classifications comparison between ESCO skills classifications and skills classifications used by Austrian and Swedish Public Employment Services.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	7	10%
	Percentage of Accessibility	17	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
	Percentage of rigour	20	20%
Completeness	Totality, credibility and representativeness	8	15%
	Percentage of completeness	8	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	66	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	

	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

It is very important for the Public Employment Services of the European countries to detail as much as they can the different skills both in CVs and in JVs. The more listed skills there are easier is the matching with the ESCO skills. Sweden shows a 60% accuracy rate due to the lack of detailed skills when Austria shows a 77% accuracy rate.
The importance of "Noise" that are skills which are introduced during the transformation but are not part of the correct skills in the target system. The noise represent more than 80% of the skills which means that only one/two out of every ten skills represented are correctly transferred skill. These can be useful for a career guidance meaning that the jobseeker sees a wider list of job opportunities.

8. Skillco – Status Report on Finding of Skill Gaps – P3 – IRSVET
Skillco WP2 General document of research results, out. Nr. 2.4, Executive Summary

REPORTS AND STUDIES: Eurostat		
URL	• https://www.skillco.eu/en/content/outputs/	
URL information	• 2 documents	
Typology	Statistics	
	Bibliographic	X
	Statement	X
Resume	The construction industry in Europe has suffered from the economic crisis explaining fewer investments in digital construction, which has been identified as the main trend for this geographical area. However, the construction industry is now recovering from the crisis and begins to adapt and invest in new technologies. The major goal underlined in Europe is the creation of new jobs such as in green	

	energy and in smart infrastructure. This reinforces the need to invest in technologies and innovation.

- Pre-analysis

The report states the economic framework in Europe based on an analysis of German, Hungarian and Slovenian economies in the construction sector.
It underlines the implementation's evolution of vocational education and training (VET) in Europe based on German, Slovenian and Hungarian cases.
It identifies skill needs in the construction industry.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	6	10%
Percentage of Accessibility		16	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	7	10%
Percentage of rigour		17	20%
Completeness	Totality, credibility and representativeness	10	15%
Percentage of completeness		10	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		63	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	X

	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

The evolution of the new technologies in the construction industry in Europe will lead to an increasing need in the workers skills related to energy efficiency and renewable energy by 2020. This shows the importance of developing a qualified workforce, the main challenge in Europe being digital construction.
The construction sector should be selected for the second wave of the "Blueprint for Sectoral Cooperation on Skills" which is a new framework for strategic cooperation between key stakeholders, and three focus areas have been identified in the construction sector: energy efficiency, digitalisation, circular economy. Skillco project was designed to identify the skill shortages meaning the most common skill gaps in the sector and elaborate and define learning units.

Methodology
- identify existing skills gaps, they proceeded to 1) the research in existing sources/data and 2) the analysis of collected data sources
- prepare the questionnaires for employers in the construction and for former students of construction VET programmes
- organise focus group meetings and interviews

4 needed skills identified: 1) **green skills**: reuse of industrial/construction waste material, recycling with the safe use of potentially harmful materials, 2) **occupational safety and health**: measures of prevention of musculoskeletal disorders and basics of ergonomics, 3) **literacy**: understanding of construction schedule and sequence of construction works and reading/understanding of project documentation, preparing time plans with the use of ICT on construction site/use of ICT technology for construction works, 4) **numeracy**: cost calculation, expenditure forecasts in construction for group of work or small objects.
But also social skills (soft): communication/vocabulary, time management, ability to lead others, written skills
Valuable vanishing skills identified: wooden construction (GE, SL) and thatched construction (HU) (linked to the natural environment of the country)
Identification of skills that workers haven't sufficiently gained

9. OECD – Getting Skills Right: Skills for Jobs Indicators

REPORTS AND STUDIES: Eurostat		
URL	• https://read.oecd-ilibrary.org/employment/getting-skills-right-skills-for-jobs-indicators_9789264277878-en#page1	
URL information	• Published in 2017	
Typology	Statistics	X
	Bibliographic	
	Statement	X
Resume	The OECD has published in 2017 an analysis on skill needs identifying the ones in shortage and surplus. The main goal is to furnish a database for every country willing to identify the skill needs and therefore the training priorities. Many factors are expected to challenge the European economies such as the new technologies, the ageing population and the increase of female workers in the labour market.	

- Pre-analysis

This report shows the occupational analysis identifying the skills that are in shortage or surplus in European economies. This can help restructure the economy in order to ease the transition of workers showing skills in surplus through a field showing a skill shortage.
It follows with the impacts and adaptability needed to new technologies identifying the skills that will soon be in shortage or surplus. Then the same approach is used with the impacts of the ageing population and of the increase of female workers on the labour market.

table 3.1 skill needs across European countries
table 3.2 Knowledge needs across European countries and SA
table 3.3 Abilities needs across European countries
table 3.6 low technology-intensive skills needs panel A. Building and construction
table 3.8 Routine manual and physical skill needs (control precision, finger dexterity, peripheral vision, depth perception)

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	5	10%
	Localisation	8	10%
	Percentage of Accessibility	13	20%
Frequency and	Frequency	0	10%

update	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		65	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	
	Sectors that generate employment	X
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

Shortage and surplus in construction

Construction and building shows a surplus in the knowledge domain across most countries and particularly in Bulgaria, the Netherlands, Ireland and Belgium. It also shows a surplus in manual and routine abilities such as physical strength, flexibility, balance and co-ordination, endurance or control movement and fine manipulative abilities. Results show that for the average country, "building and related trades workers" are in surplus, but have a very similar skills profile to "metal, machinery and related trades workers" which are in shortage. The two occupations differ, however, in that workers in the latter occupation have more technical skills than those in the former. Additional training, designed to reinforce specific technical skills of building and related trades workers could be useful for them to move into metal and machinery trades jobs that have better labour market outcomes. Training profiles can be developed for all European countries and South Africa, providing crucial information for policy makers on how to adjust training programmes to labour market needs.

New technologies
There are substantial shortages in a variety of cognitive skills and are likely to be related to automation processes that are making routine skills redundant and cognitive ones increasingly more important. Results confirms the existence of surplus in routine manual and physical skills and abilities. Control precision abilities (e.g. the ability to quickly and repeatedly adjust the controls of a machine or a vehicle to exact positions). Similarly, evidence shows a negative correlation between the increase in robots per hours worked between 93 and 07 and the shortages of control precision abilities and of physical strength needs across countries.
The transition to the digital economy implies an organisational restructuring in the workplace as they cannot replace soft skills. There will then be a rise of soft skill needs as well as skills such as co-ordination with others and ability to lead others. Results show that countries that underwent substantial restructuring in the workplace (Sweden, Denmark) are also showing stronger shortages in administration and management knowledge as well as in other key skill dimensions requiring workers to develop autonomy in making decisions and independence in the organisation of tasks.

Population ageing impacts
The average age of the employed population is rising and with them the number of workers with low cognitive skills. Countries in which the skills gap between older and younger workers is the biggest have stronger shortages of key information-processing skills. Adult training and lifelong learning are, therefore, fundamental.

-The report also underlines the high need of adaptability for teaching professionals.
-shortage skills (all sectors) are most pronounced in Luxembourg, the Netherlands, Spain or Germany but less pronounced in Hungary.
-The probability of being mismatched is strongly influenced by socio-economic characteristics but also by job characteristics (e.g. working hours).

10. Benefits of BIM and its level of adoption in European countries

REPORTS AND STUDIES: Eurostat		
URL	• http://www.buildup.eu/es/node/56441	
Typology	Statistics	
	Bibliographic	

	Statement	X
Resume	Construction sector labour-productivity growth doesn't match the labour productivity growth achieved in the overall economy. The World Economic Forum described BIM as one of the 10 most promising technologies that can act as a force for lowering the barriers for change and reversing this trend.	

- Pre-analysis

BIM is much more than a digital technology and should be considered as a strategic and complete methodology to increase construction productivity by delivering cost savings, improved construction and exploitation management, better environmental performance and quality, enhanced transparency and collaboration across the industry.
BIM is still distant from reaching its potential in Europe; and, is progressing at different speeds in European countries.
Also, BIM is usually used during the concept and design phases, but the process is not pursued during the execution phase.
Several studies have underlined the main barriers for BIM adoption: low demand, absence of national standards, initial investment or lack of knowledge and experience of stakeholders involved in the AEC industry.
Link to the BIMplement project: http://www.bimplement-project.eu/

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	5	10%
	Updating	7,5	15%
Percentage of frequency and update		12,5	25%
Rigour	Origin and impact	7	10%
	Systematisation	7	10%
Percentage of rigour		14	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%

Total	61,5	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

BIM is still distant from reaching its potential in Europe; and, is progressing at different speeds in European countries. There is insufficient knowledge in the sector to fully enfold the use of BIM. It is not used during the execution phase, only during the concept and design phase.

11. Demand for Skills in Construction to 2020

REPORTS AND STUDIES: Eurostat		
URL	• https://www.ey.com/Publication/vwLUAssets/ey-demand-for-skills-in-construction-to-2020/$FILE/ey-demand-for-skills-in-construction-to-2020.pdf	
Typology	Statistics	X
	Bibliographic	
	Statement	X

Resume	This report gives a review and prospects on the Irish economy and focuses on the construction industry. It establishes medium-term prospects for construction, the situation of the public sector then leads to overall construction prospects to 2020. It follows with the key risks, the implications for construction enterprises and skills and finishes with recommendations – enhancing skills capacity.

- Pre-analysis

This report gives a review and prospects on the Irish economy and focuses on the construction industry.
It establishes medium-term prospects for construction, the situation of the public sector then leads to overall construction prospects to 2020.
It follows with the key risks, four main implications for construction enterprises and skills and finishes with 8 recommendations – enhancing skills capacity.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	7	10%
Percentage of rigour		17	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%
Total		64	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS

Type	INFORMATION about	
Current economic situation	Job market	X
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

What comes out of the implications for construction enterprises and skills is that:
-the industry remains a fragmented sector with a large majority of self-employed firms (with no employees) and among the employing enterprises 98% are less than 10 employees enterprises.
-direct employment in construction is expected to increase
-there will be significant replacement demand for workers required to do the jobs of individuals who leave the labour market as a result of illness, retirement or death.
-a strong skills shortage could be a threat to the aging of the workers, the need of new entrants with required skills and experience will be significant. The analysis gives some numbers in needed manpower prospection and insist on implementing a strong apprentice training system to form new entrants that could replace the leaves expected in 2020.
→There is a particularly pressing issue with specialized tradespersons and the availability of apprenticeships. The combination of technical education and practical experience obtained via the apprenticeship system leaves apprentices well placed to contribute the knowledge, skills and competencies needed to work as a craftsperson in the workplace.

Recommendations to enhance skills capacity are that Government and industry should collaborate to:
-**establish a Construction Skills Forum** that would report annually to work as a feedback mechanism between industry and the education and training system allowing issues to be resolved in partnership
-**use the report as a benchmark to constantly monitor progress** and year-on-year changes, to ensure the education and training system
-**improve the image of the industry** by inspiring young people through extensive communications
-deliver an international recruitment drive to target the Irish diaspora, to attract skilled construction personnel back to Ireland

-**refine apprenticeships** and seek to introduce innovative methods of apprenticeship delivery
-engage with Solas and the Education and Training Board (ETB) network to **deliver skills courses nationally**
-**adapt initiatives** such as "Leadership for Growth" and deliver to a wider cadre of management functions within construction companies in all size cohorts of the sector
-**refocuses** CIF **Training** and its Construction SME Skillnet **on driving new skills** around modern building techniques, green construction and professionalism across the industry

12. Working Futures 2014-2024

REPORTS AND STUDIES: Eurostat		
URL	• https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/513801/Working_Futures_final_evidence_report.pdf	
URL information	• Document released in April 2016	
Typology	Statistics	X
	Bibliographic	
	Statement	X
Resume	The UK Commission for Employment and Skills is a social partnership led by Commissioners from large and small employers, trade unions and the voluntary sector. The study is the most detailed and comprehensive set of UK labour market forecasts available (released in April 2016) and is part of a series of studies *Working Futures* (2003-2004, 2004-2014, 2007-2017, 2010-2020, 2012-2022, 2014-2024). The results provide a picture of employment prospects by industry, occupation, qualification level, gender and employment status for the UK and for nations and English regions up to 2024.	

- Pre-analysis

The study gives the macroeconomic and labour market context for the UK and follows with sectoral prospects giving sector profiles (including construction). It gives also an overview of the occupational change, the prospections for the occupations in 2024, the replacement demand, the qualifications and occupational profiles (including construction and building trades).

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%

Frequency and update	Frequency	10	10%
	Updating	0	15%
Percentage of frequency and update		10	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	10	15%
Percentage of completeness		10	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%
Total		70	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

Construction is expected to see the fastest rate of growth of the sixth sectors, in both output and employment terms, resulting from an anticipated increase in public and private investment. To 2024 an employment growth is expected as the productivity growth will show positive rates.
The key factors influencing the sector are:
-construction growth will depend on the recovery of lending to the private sector and public infrastructure spending
-rising population levels in the UK are expected to increase demand for construction of housing and infrastructure
Long-term, major public infrastructure projects
-overall, regulatory policies are likely to encourage construction growth particularly as firms seek innovative processes and technologies to adapt to environmental concerns
-new types of demand will encourage technological innovations and stimulate growth

Occupational profile in construction and building trades to 2024 are mainly skilled trades employment including: steel erectors, bricklayers and masons, roofers, roof tilers and slaters, plumbers and heating and ventilating engineers, carpenters and joiners, glaziers, window fabricators and fitters.
All of these occupations imply a high level of physical duties that normally require a degree of initiative, manual dexterity and other practical skills. This underlines the importance of traineeship. Also, this occupational group will see changes in task and skill requirements, resulting from technological innovation and new business and delivery models.

13. Confédération construction – La construction numérique. Balises pour une transition réussie

REPORTS AND STUDIES: Eurostat		
URL	• https://www.confederatiebouw.be/Portals/0/documenten/documenten%20-%20enkel%20leden/jaarverslag/Rapport%20Annuel_Confederation%20Construction_2016_2017_FR_WEB-190617.pdf	
URL information	• Published in 2016-2017	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Confederation Construction is a network of large enterprises in the construction sector of Belgium. The annual report on digital construction summarize the multiple evolutions linked to the digitalization in the sector in terms of jobs impacts, regulation, new technologies…	

- Pre-analysis

The report gives an overview of the digitalisation process in Western Europe (France, The Netherlands with a detailed analysis of Belgium) as it underlines the regulatory impacts of its use. It follows with different visions of the digitalisation through enterprises, other partners and sectorial research centres. Then it

promotes the digital transition insisting on professional changes, the need of public finances and of a juridical framework, the training needs and social impacts.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
	Percentage of rigour	15	20%
Completeness	Totality, credibility and representativeness	15	15%
	Percentage of completeness	15	15%
Adequacy	Typology of source	18	20%
	Percentage of adequacy	18	20%
	Total	68	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	

	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	X
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

Digitalisation in Western Europe

The United Kingdom is since 2011 engaged in a deep modernisation of its construction sector through digitalisation. The purpose is reducing by 20% the construction costs, the timing and the heritage management costs.

The Netherlands (and other countries like Finland) have already made the BIM utilisation mandatory since 2011. It is estimated that almost 20% of the partners are already using BIM.
Public forces have started integrating the BIM since 2011, they made the e-invoice compulsory since 2017. Bouwend Nederland (Dutch Construction Enterprises Federation) plays a key role in the transition. BN says that the digital transition is already happening in the Netherlands: robotization, 3D-printing, drones, e-tools. According to BN, 20% of Dutch enterprises use the BIM in 2017. They created a survey on BIM use and it showed that the BIM barriers are: lack of knowledge about the BIM utilisation, existence, lack of standardisation in information exchange procedures, lack of demand from the workers.

France has been developing a digitalisation transition plan for more than two years. The government is willing to help enterprises to achieve the digitalisation transition.
PNTB (Digital Transition Plan in Construction) is financed by the government and aims at accelerate the digital transition in France by convincing the enterprises, allowing trainings, good communication strategy.

Belgiumis located quite behind in the line of digitalisation transition. The Confederation Construction Report shows that more than 15% of Belgian enterprises already know how to use the numeric tools in administrative management but very few of them know or use the BIM.
The digital technologies are not very known in the construction sector.
Main obstacles are that these technologies are useless (41,1%), are not essential (33,5%), too expensive (10,5%), demand too much time and qualified workforce (4,6% and 3,2%), etc.
Belgium is 6th according to the Digital Economy and Society Index (DESI).

Digital Economy and Society Index (DESI)

Using indicators like connectivity, human capital, internet use, digital technology integration and digital public services.

Digitalisation tools

Digitalisation in administrative management for higher productivity

-e-mail
-Electronic archiving
-Excel sheet
-accounting programs
-electronic invoice
-track and trace (GPS)

-ERP (Enterprise Resource Planning)
-documents management
-Cloud computing gives access to apps, data and material through the internet

-Notifications (presence checklist, ONSS e-box, work declaration, subcontractor control, social risks declaration)

E-marketing use
-website
-social networks (role of the e-reputation)

-e-procurement

Production(digital communication technologies)
-Project portal (online workspace for info sharing)
-virtual reality casks
-BIM
-Drones
-3D pilotage (GPS pilotage)
-3D scan and print
-robots
-e-objects

BIM in Belgium

This section identifies different aspects of the BIM use such as the ameliorations that it provides to the sector, the needs and obstacles slowing its spreading. It follows up giving opinions of different actors in the sector like architect, design office, material producers, contracting authority.
According to the CSTC (Scientific and Technical Centre in Construction, in Belgium), the BIM is one of the main innovations in digitalisation. It plays an important role in the conception of smart cities and smart buildings by the conception of a digital twin. The use of the BIM is a strategic priority as the Belgian governments do not apply a top-down strategy compared to other European countries where government invest millions in digitalisation of the sector.

14. How the world's top contractors are preparing for a new era of growth (EY)

REPORTS AND STUDIES: Eurostat		
URL	• https://www.ey.com/en_gl/real-estate-hospitality-construction/how-the-world-s-top-contractors-are-preparing-for-a-new-era-of-g	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	Technology spend in the construction sector remains low in FY16	

- Pre-analysis

From a technology perspective, all the top 30 have been quite actively deploying technologies, such as green concrete, lean construction, Building Information Modelling (BIM) and drones, to increase operational efficiency and cost effectiveness.
However, perhaps owing to the already thin margins in the construction industry, technology investment remains well below 1% of total revenues. In fact, our review of the top 30 global contractors shows that US

and European contractors spend close to 0.1%, in contrast to Asian contractors, which spend well above 1%.
Employee productivity also remained low (on a weighted basis, less than US$400,000 per employee) compared with other sectors, confirming that the engineering and construction sector still lags behind on productivity.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	6	10%
	Systematisation	6	10%
Percentage of rigour		12	20%
Completeness	Totality, credibility and representativeness	10	15%
Percentage of completeness		10	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%
Total		57	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	

	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

The construction sector does not invest largely in technology. Yet the world's biggest contractors do invest (green concrete, lean construction, Building Information Modelling (BIM) and drones) in order to increase productivity. Compared to other sectors the productivity remains low in the construction sector.

15. KPMG: Emerging trends in infrastructure (2018)

REPORTS AND STUDIES: Eurostat		
URL	• https://home.kpmg.com/ie/en/home/insights/2018/01/emerging-trends-in-infrastructure.html	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	From the growth in autonomous vehicles to funding models and the role of technology and innovation, KPMG's Global Emerging Trends in Infrastructure sets out some of the key issues to consider.	

- Pre-analysis

Trend one (the clash of competing forces) does not have an impact on the needed skills of the workers, but sees the infrastructure investment decisions as an important …

Also trend two (instrastucture planners start to tink about flexibility) has no (direct) impact on the needed skills of the workers. The evolution finds place with the investors, policy makers, city planners, …: don't build for today's needs, but for future needs.

In line with the previous two trends, trend three (sustainability – in all its forms – rises up the agenda) impacts not the workers on an direct way. Indirect the emerging trend demands higher product knowledge and a better appliance of the new materials and methods. This implies that the enterprises must invest in their workers to keep them up to date at all times.

Trend four sees the narrowing of the gap in the pace of development of new infrastructure (faster in mature markets, slower in emerging markets). It will reduce the risk of building infrastructure that is suboptimal before it even comes into operation.

The fifth trend (security becomes critical) describes security with a much broader scope than we normally do: cybersecurity, terrorist attacks, virulent and destructive extreme weather and fire events. Governments rethink their infrastructure plans thinking about those risks. One does not talk about the security during the building process, and the relevant skills.

Trend six predicts that governments will me more keen to debate about the financiers and the end-beneficiaries of infrastructure projects. There is a rising public awareness of the social value of infrastructure. New technologies make it possible to gather more correct information, to inform better and thus to make better decisions. Trend seven talks about flexible pricing models for infrastructure owner and administrators, trend eight about sharing big data and trend nine sees a blurring and disappearing line between real estate investors and infrastructure investors. And so more private equity in infrastructure projects with all its pro's and con's.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
Percentage of Accessibility		18	20%
Frequency and update	Frequency	8	10%
	Updating	12	15%
Percentage of frequency and update		20	25%
Rigour	Origin and impact	8	10%
	Systematisation	8	10%
Percentage of rigour		16	20%
Completeness	Totality, credibility and representativeness	10	15%
Percentage of completeness		10	15%
Adequacy	Typology of source	15	20%
Percentage of adequacy		15	20%
Total		79	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

The document gives information about the general international trends in the infrastructure sector. Although it give interesting thoughts and evolutions, there is nearly no impact on the skills of the worker force. The impact of the evolutions lie with the politicians, governments, investors, big contractors, planners, engineers and blue collar workers.

16. European Construction Monitoring 2017-2018

REPORTS AND STUDIES: Eurostat		
URL	• https://www2.deloitte.com/content/dam/Deloitte/pl/Documents/Reports/pl_European_Construction_Monitor_2017-2018.PDF	
Typology	Statistics	X
	Bibliographic	
	Statement	
Resume	The European Construction Monitor looks at the latest market developments, trends and merger & acquisitions in the European construction industry.	

- Pre-analysis

For several EU member states the document gives a small summary of the state of the construction sector. Plus some overall parameters. There is no link with trends and skills.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	8	10%
	Updating	8	15%
	Percentage of frequency and update	16	25%
Rigour	Origin and impact	8	10%
	Systematisation	8	10%
	Percentage of rigour	16	20%
Completeness	Totality, credibility and representativeness	10	15%
	Percentage of completeness	10	15%
Adequacy	Typology of source	15	20%
	Percentage of adequacy	15	20%
	Total	75	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	

	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

17. **Vers une économie circulaire dans la construction. Introduction aux principes de l'économie circulaire dans le secteur de la construction**

REPORTS AND STUDIES: Eurostat		
URL	• https://www.cstc.be/homepage/download.cfm?lang=fr&dtype=publ &doc=Vers_une_economie_circulaire_dans_la_construction.pdf	
URL information	• Published in 2018	
Typology	Statistics	
	Bibliographic	X
	Statement	X
Resume	The report is written by the CSTC (Scientific and Technical Centre in Construction, in Belgium). It summarizes the circular economy concept with its applications in the construction sector, in Belgium.	

- Pre-analysis

The text introduces the problematic that generates globalisation explaining the ecological challenges of the construction sector. It follows up with the political framework, both European and regional for Belgium. It explains the circular economy concept and gives examples related to the sector, describing the 3 pillars and the 5 principles. It details two concepts such as the circular conception and construction and the urban mining, explaining the principles, the actual and further developments and the economic challenges. It ends showing different circular economic frameworks. The different factors influencing the implementation of a circular economic model are linked to the political orientations, economic factors, social factors, technological and technical factors, environmental factors and the legislative framework.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**

Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	6	10%
Percentage of rigour		16	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		71	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

Compared to the other European countries, Belgium is already acting on recycling and stands therefore with the top countries. Regarding the political framework, the circular economy has been encouraged by the European Commission since 2015 and Belgium also developed policies in the three regions. The circular economy is based on 3 pillars which are conception and construction, new economic models and urban mining (considering buildings as the source of materials), and has 5 principles: adaptability, stratification, environmental friendly materials, assembling methods and waste management.

18. The construction industry and the circular economy (University of Gloucestershire) 2018

REPORTS AND STUDIES: Eurostat		
URL	• http://eprints.glos.ac.uk/5562/1/5562%20Jones%20%282018%29%20The%20construction%20industry%20and%20the%20circular%20economy.pdf	
Typology	Statistics	
	Bibliographic	X
	Statement	X
Resume	Analysis of the circular economy in the European construction industry providing examples from the UK, the Netherlands, Sweden, Spain, France, Ireland and Germany) and explaining different circular business models that can be used at different stages of a lifecycle of an asset.	

- Pre-analysis

The article treats the circular economy in the construction industry justifying the importance of the circular economy approach within the environmental context, explaining the circular economy concept and illustrating some examples of circular economy approaches within the European Construction Industry.
This is a scientific article coming from the University of Gloucestershire. It states the circular economy in an environmentally challenged context explaining the concept of CE. Then it follows with approaches to the CE within the European Construction Industry (UK, Netherlands, Sweden, Spain, France, Ireland, Germany). It ends explaining different circular business models that can be used at different stages of a lifecycle of an asset.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%
Frequency and	Frequency	0	10%

update	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	6	10%
Percentage of rigour		16	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		68	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

Approaches to the Circular Economy within the European Construction Industry
Ferrovial, the Spanish based construction company, for example, created a circular economy working group in 2016 'to identify and promote opportunities for transforming waste produced and managed' by its two

divisions 'into raw materials or secondary fuels, which can subsequently be used in other works and infrastructures designed, built and operated by Ferrovial' (Ferrovial 2016, webpage).
Skanska (2017, webpage), the Swedish based multinational construction company, recognised that 'significant opportunities exist in construction to prevent waste from occurring' and reported that 'we operate in line with the waste hierarchy and are working on several initiatives which aim to eliminate waste to landfill and promote the circular economy.

→(https://group.skanska.com/about-us/research-and-innovation/innovation-projects/)
Together with industry and academia partners, we have established a new industrial research school in Sweden called Automation Region Research Academy (ARRAY), exclusively focusing on future technologies in automation and automated construction.
"With the ARRAY research school there will now be an opportunity to radically change the construction sector, from a craft to an efficient industry," says Ulf Håkansson, Head of Research and Innovation at Skanska AB.
ARRAY has been jointly founded by Skanska, ABB, Volvo CE, Sandvik and Robotdalen, among others.

The Construction Products Association (2016) has identified a number of mechanisms by which construction products and materials can be reused. Salvo, for example, trades in France, Germany, Netherlands, Ireland and the UK, and offers a reclamation service for architectural antiques, doors, fireplaces, ironwork, lighting, radiators, windows and stained glass.

Toyne (2016) has provided some illustrations of how Balfour Beatty employed a circular design approach in using King Sheet Piling on the M25 widening project and the A421 improvement project in the UK and claimed significant savings in the steel used and reductions in carbon dioxide emissions.

In the Netherlands Bam employed circular design principles in the construction of a new town hall extension for the municipality of Brummen. Here the local authority commissioned a building for a service life of just 20 years and Bam designed a building for disassembly. The extension's modular design will not only enable easy disassembly and some 90% of the materials in the newly added space can be dismantled and reused at the end of the extension's service life.

19. BUILD UP SKILLS

19.1 Analysis of the national status quo 2012 (Belgium)

REPORTS AND STUDIES: Eurostat		
URL	• http://www.buildup.eu/sites/default/files/bus_projects/busbelgiumnsq_0.pdf	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The analysis of the National Status Quo (NSQ) shows that an overwhelming majority of the annual intake of construction workers consists of young people without formal qualifications. This means in other words that there is a substantial intake of unqualified personnel. Consequently, raising the competency level of the workforce up to standard will	

	constitute a challenge for the current workers.

- Pre-analysis

The analysis features the construction sector, the national policy and strategies to contribute to the EU 2020 energy targets in buildings, the statistics on buildings and energy sectors, the existing VET facilities, the gap between the current situation and the needs for 2020 in terms of skills and its barriers.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		67	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	

	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	X
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

The vocational competencies relating to renewable energy and energy efficiency were also updated. Reworked vocational profiles have been validated at this time for the following occupations:

- Roofer
- Weatherproofing roofer
- Plumbing installer
- CH fitter
- Ventilation systems installer

Other occupations will be updated at a subsequent stage. Work is currently in progress on the following occupations:

- Roofing carpenter
- Timber frame construction
- Exterior joinery worker
- Interior joinery worker
- Interior fitter

Attached you will find the additional competency requirements that are relevant to Energy Efficiency and Renewable Energy for the occupations that have already been updated, notably Roofer, Weatherproofing roofer and CH fitter, Plumber and Ventilation systems installer.

- different barriers that impede the expansion of the technical collaborators' skills in the working field have been mapped:
- a shortage of qualified workers (irrespective of training);
- a shortage of trained workers;
- a high-quality execution of contracts does not offer any economic added value;
- the existing training courses are too theoretical;
- the existing manpower allocation does not offer any opportunity to enter into any results or performance commitments;
- technical progress is not being followed up on soon enough;
- the way in which the work is organised does not allow workers to be sent for training;
- the cost of training is too high to send workers for training;
- there are no results or performance commitments included in the scope of contract execution.

Obviously, the Belgian construction industry perceives a major shortage of qualified workers (irrespective of training too). In addition to this, there is the call for high-quality work to be valued. The quality of existing training courses can also be improved, with a better follow-up on technical progress in particular.

19.2 Status quo 2012 (Denmark)

REPORTS AND STUDIES: Eurostat		
URL	• http://www.buildup.eu/sites/default/files/bus_projects/statusquo_uk_final_150612_0.pdf	
URL information	• 2012	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The status quo report concluded that there would be a shortfall of up to 13,100 skilled construction craftsmen if the sector is to meet its share of the 2020 goals. The current competence level is thus insufficient and is a barrier to meeting these goals. The roadmap presents concrete initiatives aimed at overcoming this barrier. There are several approaches to this. The workforce supply can be increased; the current workforce can have its skills in energy efficiency and the use of renewable energy upgraded through continuing and further education and training; and the loss of skilled workforce to other sectors can be minimised.	

- Pre-analysis

This report provides an overview of the size of Denmark's heated building stock and its energy consumption for heating. The report also presents current upper secondary vocational education programmes and adult continuing education and training offers that target energy optimisation of the building stock. This status quo provides the basis for examining the extent of necessary future energy saving measures and the competence needs of the workforce in order to reach the 2020 goals.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%
Frequency and	Frequency	0	10%

update	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	12	15%
Percentage of completeness		12	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		67	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

The construction sector has shown an almost continuous negative trend since 2000, which makes labour productivity one of the sector's major challenges. At the same time, there has been a growth in labour

productivity in manufacturing, which could indicate the need for increased industrialisation in construction processes. Two scenarios are identified in order to predict the sector evolution in the coming years:

Scenario A: The optimistic, which includes positive factors
Energy consumption for heating is reduced by 0.5% per year from 2011 – 2014
Around 10% of the overall energy savings is attributed to "do-it-yourself" work
Energy consumption for heating is reduced by 80 GWh/year
Other initiatives account for 10% of the total energy savings
The effect of energy saving initiatives is not reduced temperature)

Scenario B: the conservative, which includes negative factors
Unchanged energy consumption for heating from 2011 – 2015
The effect of "do-it-yourself" work is not included
Unchanged conditions corresponding to the historical development
Other initiatives are not included
The effect of energy saving initiatives is reduced by 10% (1 °C higher indoor

Skilled construction sector craftsmen needed for the energy saving initiatives from 2015 to 2020 (numbers are increased in scenario B, being the pessimistic): Bricklaying, carpenter/joiner, plumbing/heating/air conditioning (VVS), electrical installations.

Barriers for reaching the 2020 goals have been identified at a workshop held by the consortium with the participation of representatives from the stakeholder group. The lack of interdisciplinarity in the construction sector is seen as the greatest challenge, presenting itself in several ways:

- There is a general lack of interdisciplinary insight and understanding between craftsmen's trades.
- The construction workforce most often does not have the necessary competences to be able to conceive of a building holistically, and is too narrowly focused on own areas of expertise.
- There is a lack of understanding between consultants and craftsmen, and there are often communication breakdowns that can hinder energy savings.

There are also specific fields within the vocational education programmes that need to be strengthened, for example competences relevant to new renewable energy sources such as solar panels and heat pumps, and greater insight in sealing and the proper positioning of vapour barriers.
The identified barriers indicate that there is currently a range of additional gaps that are not directly related to education content but which are structural or more overarching, such as:

- There will be a lack of well-educated manpower to carry out energy improvement initiatives if demand increases in the future.
- There are a number of barriers in the current vocational and continuing education systems for skilled workers. Some are structural, some are economic, and some are based on familiarity and image.
- Many members of the construction workforce are semi-skilled[1] and need their skills upgraded.
- There is a lack of an incentive structure that can stimulate interest in continuing education and training.

19.3 Analysis of the national status quo (Italy)

REPORTS AND STUDIES: Eurostat		
URL	• http://www.buildup.eu/sites/default/files/bus_projects/analisys_of_status_quo.pdf	
Typology	Statistics	

	Bibliographic	
	Statement	X
Resume	The national status quo report identifies the needed skills and the workforce gap in the construction sector.	

- Pre-analysis

The national status quo identifies and illustrates the professional skills, required and potential, and the training requirements corresponding to employment opportunities which could occur in the building and plant installation sector so that Italy can reach the targets laid down in the 20-20-20 climate package.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	9	15%
Percentage of completeness		9	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		64	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS	
Type	**INFORMATION about**

Current economic situation	Job market	
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	X
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation of the information

The green economy has led to the creation of specific jobs such as installers of photovoltaic panels and other clean technologies. These new jobs, according to the research by Ires Cgil, require new skills to be developed through training and the adoption of training programmes. The study has identified 16 new professions for thermal and photovoltaic solar energy; 14 new professions for wind energy; 13 new professions for biomass sources and 11 general figures.
It should be pointed out that the new employment would be distributed in the following sectors: electric (19%), metal products (4%), building (8%), wholesale trade (4%), professional activities (18%) and other activities (47%).

Workforce gap (between 805 and 33.038)

- Masons,
- Carpenters,
- Workers installing insulation, windows and fittings,
- Painters,
- Other building workers,
- Floor layers, layers of lining and plasterers,
- Electricians,
- Plumbers and heating experts,
- Others

20. Country Profile ECSO (Poland)

REPORTS AND STUDIES: Eurostat	
URL	• http://ec.europa.eu/regional_policy/en/information/publications/factsheets/2015/country-profile-key-indicators-poland

Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet identifies the evolution of the number of job vacancies in the construction sector, the causes of a skill shortage. Some regulations have been implemented regarding the waste management but mostly have to be regulated on regional and/or national level where nothing concrete is done. Regarding innovation, Poland develops a lot of research but nothing is concrete is done.	

- Pre-analysis

Polish Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
	Percentage of rigour	20	20%
Completeness	Totality, credibility and representativeness	15	15%
	Percentage of completeness	15	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

SKILSS SHORTAGE
In 2015 there were 7.301 job vacancies in the Polish construction sector which represents an increase by 60.7% compared to 2013.
The construction sector presents one of the highest share of bottleneck vacancies.
Causes of the shortage are:
-significant migration of young construction professionals to Northern and Western EU countries (UK and GE)
-number of tertiary students in Engineering, manufacturing and construction has been growing steadily
-life-long learning is still undeveloped, with adult participation in education and training standing only at 2.9%.
-need for a formal and pan-European certification of the qualifications relevant to the construction industry related to two trends: 1) Polish migrant workers are mostly educated at the vocational level (60% of employees in the sector display medium-level skills) but the Polish system is not recognized abroad forcing migrants to work below their qualifications (it is the same as migrants acquire new skills abroad and come back to Poland) AND 2) Polish construction sector is dominated by small companies and self-employed people (there is a high competition and a certification of certain services would enhance the credibility of such companies)
Polish VET suffers from low quality and limited alignment of curricula with labour market needs, which in turn leads to low levels of participation and lack of needed skills, however the participation proportion of students increased in 2016 to 49,2%, close to the EU average of 48.0%. The employment rate of VET graduates stood at 74.3% in 2016 compared to the EU average of 75.0%.

Even though skills mismatch is high in the construction sector, there is currently no dedicated policy measure for vocational education in construction

Polish VET suffers from low quality and limited alignment of curricula with labour market needs, which in turn leads to low levels of participation and lack of needed skills, however the participation proportion of students increased in 2016 to 49,2%, close to the EU average of 48.0%. The employment rate of VET graduates stood at 74.3% in 2016 compared to the EU average of 75.0%.
Even though skills mismatch is high in the construction sector, there is currently no dedicated policy measure for vocational education in construction

WASTE
Poland has no specific legal provisions dedicated to construction & demolition (C&D) waste. Instead, the Act on Waste adopted in 2012 implements the EU Waste Framework Directive as well as other EU legislation related to waste management.
The Act stipulates that plans should be implemented at national and regional level to meet the objectives. Currently all C&D waste is managed individually by Municipalities and City Councils.

INNOVATION
Poland is considered a Moderate Innovator according to the European Innovation Scoreboard 2017.
eco-innovation and digitalisation
Innovation in the construction sector takes mostly the form of energy efficiency improvements, notably thermal upgrade of buildings
Several initiatives have been launched such as a partnership between scientists, business and institutions supporting innovative solutions matching the concept of sustainable construction under the Building Research Institute.
Research and Development Department has been established that recognizes available technologies and green building solutions.

http://ec.europa.eu/social/BlobServlet?docId=12666&langId=en (document available in the references of the ECSO Country Profile Poland)
Bottleneck vacancies within the construction sector relate to jobs for manual and skilled workers (**brick layers, plasterers**) as well as to highly skilled civil engineers
shortage in **building and related trades workers, excluding electricians**
The construction and transport sectors are strong pillars of the Polish economy and have recently experienced significant economic growth.
Consequently, both sectors are characterized by high number of vacancies accompanied by high proportions of hard-to-fill vacancies.

21. ECSO – European Construction Sector Observatory

REPORTS AND STUDIES: Eurostat		
URL	• http://ec.europa.eu/growth/sectors/construction/observatory/	
URL information	•	
Typology	Statistics	X
	Bibliographic	X

	Statement	X
Resume	The European Construction Sector Observatory (ECSO) is a three-year action (2015-2017) that is working to inform European policymakers and stakeholders with regular analysis and comparative assessments on the market conditions and policy developments in the construction sector in EU-28. The objectives of ECSO are to: 1) monitor market conditions and trends, and national/regional strategies in relation to the five thematic priorities of Construction 2020; 2) facilitate knowledge sharing and awareness on policy measures and initiatives that impact the construction value chain. ECSO is profiling the construction industry in each EU-28 Member State by producing **28 detailed reports** (Country Fact Sheets - CFS). Each CFS provides an analysis of most up-to-date key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, as well as also tracking the current status and national strategy to meet Construction 2020 priorities: 1. Stimulating favourable investment conditions 2. Improving the human-capital basis of the construction sector 3. Improving resource efficiency, environmental performance and business opportunities 4. Strengthening the Internal Market for Construction 5. Fostering the global competitive position of EU construction enterprises ECSO is also identifying and analysing specific policy measures (Policy Measure Fact Sheets - PFS) that are being implemented in each member state to stimulate construction sector employment, growth and opportunities, and to help overcome societal challenges.	

- Pre-analysis

Country profiles available for the 28 European countries.
Each country sheet provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	0	10%
	Updating	7	15%

	Percentage of frequency and update	6	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
	Percentage of rigour	20	20%
Completeness	Totality, credibility and representativeness	15	15%
	Percentage of completeness	15	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	79	**100%**

21.1 Country Profile ECSO (France)

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/growth/sectors/construction/observatory_en	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet gives an overview of the EBF in France, as the need of updated skills within construction professionals. Therefore it focuses on the training needs explaining the main difficulties. These new skills are mainly linked to the digitalisation (for example, the utilisation of the BIM) and to the greening of the economy through energy efficiency.	

- Pre-analysis

French Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%

Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

EBF

As for employment by specific occupation, the number of plant and machine operators in the construction sub-sector saw the largest decline, from 150,600 in 2010 to 99,100 in 2016 (-34.2%), followed by craft and related trade workers (-29.5%, from 1.2 million to 865,400). Conversely, the number of technicians and associate professionals increased by 120.6%, from 185,900 to 410,100 over the same period, followed by managers (+51.5%). REGULATIONS: the Construction and Housing Code (Code de la construction et de l'habitation) sets out general provisions related to the construction and renovation of buildings; energy and environmental performance; fire protection; heating, water supply and building repairs.

Health & Safety

the Asbestos R&D Plan (Plan Recherche et Développement Amiante - PRDA) is a three-year programme launched in 2015 by the Ministry of Housing. Through a EUR 20 million budget, PRDA provides financial support for R&D projects aiming to develop innovative technologies to decrease the costs and delays associated with asbestos-related interventions and works. Ultimately, the PRDA seeks to improve the detection and measurement of asbestos on site, as well as the management of construction sites affected by asbestos whilst ensuring health and safety.

Skills shortage

adult participation in education and training in the construction sub-sector went from 6.3% in 2010 to a record high of 15.8% in 2014, subsequently declining slightly to 15.5% in 2016. Despite these figures, the French construction sector faces risks linked to the shortage of young workers with the new skills required by the evolving needs of the sector, namely with regard to energy efficient renovation and digital construction. Indeed, estimates point towards the need to train up to 80,000 workers in Building Information Modelling (BIM) by 2020, i.e. about 27,000 per year. According to a recent study from the National Institute of Statistics and Economic Studies (INSEE), 50% of companies in the building sector cite lack of adequate skills as a barrier to hiring. More broadly, the French Building Federation voices concerns in all sub-sectors with regards to skills mismatches and would welcome new national initiatives, for example the upcoming reform on apprenticeships targeting the youth. This is the case, even though the number of posted workers in the construction sector in France is significant, amounting to 39.6% of the 177,674 posted workers France received in 2015. With regard to the construction sector, it is estimated that 1.3 million employees and craftsmen will require to be upskilled by 2020 in areas such as digital technologies and energy performance and, consequently, 12,000 trainers will need to be trained. the Action Programme for Construction Quality and Energy Transition (Programme d'Action pour la qualité de la Construction et la Transition Energétique - PACTE) seeks to foster the development of the energy eddiciency skills od construction progessionals so as to strenghten the overall quality of French constructions.

Trainings

The employment rate of vocational education and training (VET) graduates in France was 64.8% in 2016, well below the EU average of 75%, while participation of upper secondary students in VET was 41.5%, also below the EU average of 47.3%. the labour market performance and employment status of students having completed an apprenticeship is almost 20% greater than for school-based VET graduates (lycées professionnels). Both the VET and the apprenticeship systems have been criticised for their lack of adaptability to the needs of the labour market, as well as for their regional quality divergences. Moreover, access to continuous VET is difficult for the unemployed and lower skilled, as well as for employees of small companies. To this end, the government opened 500 additional VET paths in 2017 and will cooperate with local governments to improve synergies between the school-based VET and apprenticeship paths for greater flexibility. + the FEE Bat initiative is an agreement between varuous industry actors to offer training

courses on thermal renovation of existing buildings, covering both technical implementation aspects as well as those related to the overall energy performance of buildings.

Digitalisation
the Building Digital Transition (PTNB) initiative seeks to improve the difital skill-base of construction professionals. One of its actions is to include the assesment of the offer for BUM trainings and benchmarking of international initiatives, aiming to provide construction progessionals with a comprehensive picture of all training opportunities available and thus guiding them in theur difital transition, to provide training centres with the opportunity to further align their courses with the needs of the industry.

BIM
in order to support companies in upskilling their employees, the PTNB has developed pedagogical tools to facilitate the development of trainings. Finally, in creating trust, the PTNB defined and implemented a strategy to promote the standardisation of BIM among construction actors. only 13% of respondents to a recent survey declared using BIM regularly in their operations. However, there are signs of improvements, as this number stood at 11% a year earlier.

Green economy
The Waste Management Plan for 2012-2017, published by the Environmental Protection Agency, emphasises the need for improved waste statistics and improved Construction and Demolition (C&D) waste management. The Energy Transition Law (Loi de transition énergétique) sets a recycling target of 70% for C&D waste by 2020. Moreover, it stipulates that, as of January 2017, distributors of construction materials, products and equipment shall take back the waste arising from the same type of materials, products and equipment they sell. The Building Digital Transition Plan (Plan pour la Transition Numérique dans le Bâtiment - PTNB) was created in early 2015 for a duration of three years, with the aim of bringing about the adoption and deployment of digital technologies in the construction sector, with a particular focus on BIM.
+ several initaitives/regulations/actions of eco-innovation.

21.2 Country Profile ECSO (Germany)

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/growth/sectors/construction/observatory_en	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet gives an overview of the EBF in Germany which is related to its particular population context, enhances the performances of Germany in greening its economy, in innovation and in digitalisation. as the need of updated skills within construction professionals. Therefore it focuses on the training needs explaining the main difficulties. These new skills are mainly linked to the digitalisation (for example, the utilisation of the BIM) and to the greening of the economy through energy efficiency.	

- Pre-analysis

German Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
Percentage of Accessibility		18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X

	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Digitalisation
the digitalisation of the construction sector stimulates innovation. The Federal Ministry of Transport and Digital Infrastructure supports the use and uptake of Building Information Management (BIM) for the whole supply chain of planning, construction and operation. Besides sponsoring pilot-projects, a national step plan for the BIM implementation was presented in 2015. It provides that BIM will be introduced by 2020 as the new standard for transport infrastructure projects. In 2017, the Ministry of Economic Affairs and Energy presented a new energy audit tool - the 'tailored renovation roadmap' is a software-based tool that serves to provide an overview of the modernisation work a particular building will require over time. The roadmap is key to the ministry's efforts to implement the government's Energy Efficiency Strategy for Buildings.

Green economy
The recovery rate of C&D waste in 2015 was of 89.0% (well above the 70% target for 2020). Some regions are experiencing a shortage of landfill capacity for contaminated C&D waste which cannot be recycled. This process may take up to 10 years.
REGULATIONS: there are considerable variations among Germany's 16 regions. Energy Efficiency Strategy for Buildings of the Federal ministry for Economic Affairs and Energy, adopted in 2015, integrates electricity, heat and efficiency aspects, setting a comprehensive framework of measures. The Energy Saving Act and Energy Saving Ordinance implement the goals of the Energy Concept and Energy Efficiency Strategy and transpose the EU Directive on the energy performance of building (2010/21/EU). They both introduce the obligation for new buildings to be constructed as nZEB and the increase of energy efficiency standards by 20-25% starting in 2016. plus, the Renewable Energies Heat Act sets the obligation to use renewable energies in new buildings, aiming to increase their share in the heat sector to 14% by 2020.

Skills shortages
While there has been shortages in occupations such as plumbing, plumbing, heating and air-conditioning technology as well as in the finishing trades for some time now, since summer 2017 there has also been a shortage in building construction and civil engineering.
High immigration rates: migrants often lack necessary language skills and need to be provided with the necessary education before being employable.
TRAINING: different projects are implemented in order to compensate the lack as young talent by dual learning.

EBF

In 2014, there were 650,813 enterprises operating in the broad construction sector in Germany, predominantly micro, small and medium. Production in construction registered an overall growth rate of 10.4% over 2010-2016. In particular the civil engineering segment recorded a strong performance over this period (+18.6%), while growth in the construction of buildings stood at 8.5%. In parallel, employment in the broad construction sector in Germany increased considerably since 2010 growing from 2,938,001 to 3,820,706 in 2016 (+30.6%).
TURNOVER: new construction apprenticeship contracted are lower than the share of workers that retired in 2016. The ratio of apprentices to skilled workers was 8.7 in 2014, below the critical value of 10, evidencing an unmet demand for skilled workers, particularly in enterprises with fewer than 100 employees.
FOREIGNERS: the amount of foreign workforce has increased due to the lack of skilled professionals. foreign (non-EU) workers with relevant recognised vocational qualifications have been allowed.

21.3 Country Profile ECSO (Austria)

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/growth/sectors/construction/observatory_en	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet gives an overview of the training needs and skills shortage in Austria explaining the good functioning of its VET system.	

- Pre-analysis

Austrian Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%

Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

EBF

EMPLOYMENT: from 2016 construction output will be increasing in employment expected by 2018. Renovation is going to grow, boosting demand for tinsmiths, construction site workers, roofers, plumbers and installation technicians.

Green economy
investments in energy efficient renovation and conversion of heating systems have the potential to create up to 35,000 additional jobs by 2020. According to the Waste Framework Directive (2008/98/EC) and the Austrian Federal Waste Management Plan, 70% of non-hazardous construction and demolition waste has to be reused or recycled by 2020. Austria is already a leader among European countries in terms of the management of construction and demolition waste (CDW). Austria is considered a leader in ecological construction and particularly with respect to passive house building. Austria aims at implementing the requirement by 2020 and establishing Energy Efficiency Obligation Scheme to achieve the target of energy savings. The number of workers employed in the broad construction sector in Austria is projected to increase by 12.8% in 2017 and 17.2% in 2018. The number of firms operating in the broad construction sector is expected to grow to 77,677 in 2017 and to 81,124 in 2018.

Trainings
Well-functioning VET system with high participation rates, a shortage of construction-related professions is presented on the list of shortage occupations for 2017. Austria is enhancing the green skills of its workforce through the klima:aktiv initiative which focuses, among others, on providing advanced vocational training in the fields of renewables, energy efficiency and mobility

Skills shortages
Austria lacks high-skilled labour and faces difficulties in attracting young people to work in the construction sector, mostly due to a poor image of the sector. Adult participation in education and training in the broad construction sector has been fluctuating since 2010, In the construction sub-sector, the participation rate went down from 12,1% in 2010 to 11,9% in 2016, declining to 1,7% by 2016. List of shortage occupations for 2017 includes (engineers...) but also roofers (including master roofers). VET enjoys one of the highest rates of participation EU-wide, namely 70% in 2014 (EU average: 48%). The good quality of the VET system is a key contributor to low levels of unemployment for recent upper secondary graduates. The share of young people (15-29) not in education, employment or training is one of the lowest. It focuses on integrating also young refugees (high immigration rate), There are incentives for enhancing apprenticeships (bonus). The Master Builder Campaign enhances the image of the industry by running TV-spots as well as YouTube videos + enhancing the green skills of its workforce through the programme klimaaktiv. Austria seeks to increase the number of blue collar workers and building inspectors with special nZEB competence, who could gain knowledge and skills about quality renovations works with energy saving impact, and develop missing qualification and certification.

21.4 Country Profile ECSO (Sweden)

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/growth/sectors/construction/observatory_en	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet gives an overview of the training system in Sweden as the and skills shortage in Sweden explaining the good functioning of its VET system.	

- Pre-analysis

Swedish Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
Percentage of Accessibility		18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X

	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Green economy
The Waste management plan for 2012-2017 published by the Swedish Environmental Protection Agency emphasises the need for improved waste statistics and improved Construction and Demolition (C&D) waste management, namely recycling. Sweden focus mainly on eco-innovation, particularly associated with products and organisational processes, which account for 30% and 20% of the innovative measures adopted by the companies, respectively. These include the construction of energy efficient and carbon-smart housing (e.g. LEED-certified), but also internal measures aiming to improve the environmental performance and footprint of the companies themselves.

Skills shortages
adult participation in education and training has been on the rise. In the construction sub-sector, it went from 15.1% in 2008 to a peak of 18.9% in 2016. Sweden is experiencing a slight skills shortage in the narrow construction sector, both for blue and white-collar workers. The Swedish Migration Board regularly updates the list of occupations experiences labour shortages and in January 2018 it included architects, surveyors, civil engineers, bricklayers, roofers, floorers, scaffolders, painters and concrete workers. The skills shortage is expected to increase in the coming years, due to growing investments in construction, coupled with high retirement rates in the sector. The Construction Industry Association has assessed that 50,000 new employees will be need over a five-year term solely because of aging. Further needs arise due to the projected construction of 600,000 new dwellings by 2025 and the infrastructure projects outlined in the national transport plan 2018-2029.

Skills identification system
A further step in this direction was made through the ID06 Skills Database (Kompetensdatabasen), developed in 2013 by the Swedish Construction Federation. It is an electronic card that stores and centralises all the professional qualifications of workers on the building site, enabling the site manager to quickly check that all employees have the necessary skills to perform their respective tasks. This system constitutes a means to limit undeclared illegal work, to ensure the appropriate level of skills and consequently to enhance the safety of the workplace and the quality of the construction output.

Trainings
VET system

The employment rate of VET graduates stood at 81.6% in 2015, one of the highest in the EU. Nevertheless, participation of upper secondary students in VET is decreasing, and the transition between the different training pathways (e.g. upper secondary school, adult education, the apprenticeship system and training for the unemployed) remains challenging. The Swedish VET system is well developped, with dual education programmes combining practical xork experience with theoretical teaching having been introduced and boasting good participation among employers. Other training systems

The Swedish Construction Federation also plays an active role in the training of the construction workforce through its Entrepreneurship School (Entreprenörsskolan), which offers training courses in areas such as health and safety, construction law, construction management and energy and the environment, as well as e-learning modules and seminars. In order to develop the energy efficiency skills of the construction workforce, the Swedish Construction Federation together with other industry stakeholders launched Energy Builders (Energibyggare), a four-hour interactive web-based training in the field of energy-efficient construction and renewable energy tailored to all parties active on a construction site, including builders, installers, supervisors and managers. The programme includes areas such as thermal insulation, air-tightness, moisture control and installations. Upon successful completion of the training, the acquired qualification can be registered in the ID06 Skills Database.

21.5 Country Profile ECSO (Luxemburg)

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/growth/sectors/construction/observatory_en	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The Country Fact Sheet gives an overview of the training system in Luxemburg as the and skills shortage and other training systems/actions implemented on attracting labourers in the sector.	

- Pre-analysis

Luxemburgish Country Fact Sheet (CFS) provides an analysis of key figures, macro-economic indicators, economic drivers, issues and barriers, innovation, the national/regional policy and regulatory framework, and the current status and national strategy to meet Construction 2020 objectives.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%

Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	10	10%
Percentage of rigour		20	20%
Completeness	Totality, credibility and representativeness	15	15%
Percentage of completeness		15	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		73	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Green economy
In terms of legal framework for the management of C&D waste, two main pieces of legislation are applicable in Luxembourg, namely the Law of 21 March 2012 on management of waste and the Grand-Ducal Regulation of 24 February 2003 on landfilling of waste, as amended. In addition, Luxembourg introduced a General Waste Management Plan in 2010, which also covers C&D waste.

Skills shortage
The number of job vacancies in the construction sub-sector experienced an increase by 107.5% from 2010-2015, namely from 120 to 249. According to the FEDIL, the Business Federation in Luxembourg, the construction sector will be in need of qualified personnel given that 6,000 people will reach retirement age until 2020. In terms of most needed qualifications in the construction sector, it appears that mason, brick layers and façade specialists are among the professions highest in demand.

Training
VET
adult participation in education and training in the construction sub-sector increased from 8.2% in 2010 to 10.0% in 2016 with a peak of 11.3% in 2014, above the EU28 average standing at 9.2%. Despite high enrolment rates, completion rates of VET education are below average with only 29% of students finishing their education in the foreseen time as opposed to 64% in the OECD96. Furthermore, the Luxembourgish system offers training paths based on the dual principle, but also ones that are mostly school-based, thus lacking consistency in its VET approach. To improve the VET system, a reform process was initiated in 2015 aimed at increasing the overall matching of skills with labour market needs97. A law was adopted in March 2016, applicable for school year 2016/2017 and puts emphasis on quality learning outcomes. Moreover, it is aimed to ensure the quality for work-based learning and encouraging specifically SMEs from offering apprenticeships. This is done in collaboration with the professional chambers. Alongside this reform, a bill was passed in 2015 in order to offer financial support for companies that invest in life-long learning for their employees.

Others
LuxBuild 2020 runs from mid-2014 to mid-201799. A website has been put in place in 2017, in order to centralise all the information on the trainings offered. a number of trainings and certifications are available on the market, offered by the public sector or trades association. For instance, myenergy offers a voluntary certification for energy advisors. The Luxembourg Chamber of Crafts is also active in delivering trainings on energy renovation, passive house, ventilation systems etc.

22. Mapping and Analysis of the Bottleneck Vacancies in EU Labour Markets

REPORTS AND STUDIES: Eurostat		
URL	• https://ec.europa.eu/eures/downloadSectionFile.do?fileId=8010	
URL information	• 2014	
Typology	Statistics	X
	Bibliographic	
	Statement	X

Resume	The aim of the current study has been to identify the top-20 bottleneck occupations on the EU labour markets (in all Member States and including Iceland, Norway and Liechtenstein). The outcomes of the assignment are meant to be used for the development of policy instruments for better mitigation of existing bottleneck occupations. Building and related trades workers, excluding electricians, are the second biggest group of skilled manual occupations, where bottlenecks have been identified. All in all 41 bottlenecks exist in 18 of the 29 study countries included in this report. As shown in Table 25, the division between the specific occupations is rather clear-cut: in particular carpenters and joiners (11 bottlenecks) and plumbers and pipe fitters (8 bottlenecks) are in high demand, whereas one or two bottlenecks exist for most of the other specific occupations within this occupational group.

- Pre-analysis

Final overview report of the study —Mapping and Analysing Bottleneck vacancies on the EU Labour Market . It consists of a presentation and analysis of common features and differences of national labour markets and the existence of bottleneck vacancies.
Bottleneck occupations should in this context be understood as occupations where there is evidence of recruitment difficulties, i.e. employers have problems finding and hiring staff to meet their needs.

Top 20 bottleneck vacancies at ISCO 4-digit level European level (per occupation)
#10: carpenters and joiners (in 11 countries)
#17: Plumbers and pipe fitters (in 8 countries)
#19: Building and related electricians (in 6 countries)

Top 20 bottleneck vacancies at ISCO 2-digit level European level (per sector)
#5: Building and related trades workers, excluding electricians (18 countries reporting 41 bottleneck vacancies)

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	8	10%
	Percentage of Accessibility	18	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%
Rigour	Origin and impact	10	10%

	Systematisation	5	10%
	Percentage of rigour	15	20%
Completeness	Totality, credibility and representativeness	12	15%
	Percentage of completeness	12	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	65	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	
	Sectors that generate employment	X
	Occupations that generate employment	X
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation of the information

The rank of the specific occupation among the top-20 bottleneck occupations in the country in question is indicated in parentheses behind each occupation. The national ranking per each occupation is included only when available. If further specification of the 3- or 4- digit level occupational category was provided in the national ranking, this is included in parentheses, specifying its rank.

- Austria
  - Carpenters and joiners (specifically: Carpenter (7); Joiner (13); Construction- and furniture joiner (16))

    - Roofers (4)
    - Plumbers and pipe fitters (12)
- Croatia
    - Bricklayers and related workers (13)
    - Carpenters and joiners (14)
    - Plumbers and pipe fitters (15)
- Denmark
    - Carpenters and joiners (specifically: Carpenter (7); Joiner (13); Construction- and furniture joiner (16))
- France
    - Roofers (6)
    - Plumbers and pipe fitters (specifically: Pipe fitters(20))
- Italy
    - Plumbers and pipe fitters (specifically: Plumbers (5))
    - Air conditioning and refrigeration mechanics (specifically:Heating system mechanic (2))
- Portugal
    - Building frame and related trades workers not elsewhere classified (2)
    - Painters and related workers (20)
- Poland
    - Building and related trades workers, excluding electricians (1)
      (NB: Meaning almost all job vacancies in the sector (it includes building and related trades workers, excluding electricians, building finishers and related trades workers and painters, building structure cleaners and related trades workers).

Building and related trades workers, excluding electricians, are mainly needed in the European construction industry, where almost all bottlenecks within this occupation group were identified. More specifically, construction of buildings and specialised construction activities are in need of qualified employees representing this occupational group. In the construction sector the lack of labour force is in many countries related to labour mobility, as can be seen from the section below.

Main reasons for bottleneck problem
-Lack of applicants meeting the skills requirements for the job
-Applicants with necessary skills are available, but not willing to take the job due to different reasons
-Both reasons above
Because of: →an overall unfavourable perception of manual construction work
→few young people interested in the occupations
→the pay is considered low in some countries
→the status of the occupations is low
→workers mobility as part of the workforce leaves the country results in both a labour and a skills shortage, as those remaining lack adequate qualifications.
In Austria, the lack is also attributed to a decrease in training offer.
Solutions:
In this context, awareness-raising campaigns to attract employees to building and related trades workers and to the industry in general, can be considered a viable strategy to alleviate the lack of interest towards those professions. Labour mobility is also to be mentioned as causing bottlenecks in some of the European countries, where qualified workers left to work in the construction sector in other European countries. The economic crisis, however, has partly diminished the needs in the construction sectors of some of the receiving countries, as for instance Spain, making return schemes relevant.

23. VET4LEC – Inclusive Vocational Education and Training for Low Energy Construction

REPORTS AND STUDIES: Eurostat		
URL	• http://www.fiec.eu/en/fiec/projects/current-5460/vet4lec.aspx	
URL information	• Platform actualised in October 2018	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The project aims to identify the implementation of vocational education and training (VET) for low energy construction (LEC) in 10 European countries which are Belgium, Germany, Finland, Spain, Italy, Bulgaria, Hungary, Poland, Slovenia and Ireland.	

- Pre-analysis

The project contextualises the low energy concerns in the construction sector insisting on the need of a trained workforce, the different set of knowledge, skills and competences that it implies and the interdisciplinarity that it requires through communications between all different actors implied in the process.
It explains the different school systems implemented in the 10 countries as these countries reflects the Mediterranean system, the Scandinavian system, the Eastern system, the German system and the Anglo-Saxon system. Then it explains the role of the social partners in the VET in each country as the regional implementations in order to cope with the needs. It follows up identifying the challenges at implementing the VET, the factors enabling it and the important trends through all the different countries giving short and long term measures to take.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	5	10%
Percentage of Accessibility		15	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%

	Percentage of rigour	15	20%
Completeness	Totality, credibility and representativeness	8	15%
	Percentage of completeness	8	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	58	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	X
	National economic situation	X
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	x
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Some similarities observable between some countries:

- Mainstreaming of VET for LEC: Belgium and Germany
- Concerted attempts to embrace nZEB and develop VET for LEC: Ireland and Finland
- Many regional and local initiatives in particular in terms of continuing VET (CVET): Italy, Spain, Slovenia and Poland
- More limited and sporadic efforts observable: Bulgaria and Hungary

Grouping by traditional industrial relations:

- Germany and Belgium represent the Germanic system with strong social partnership and a strong dual system with common curricula;
- Italy, Spain and perhaps Slovenia represent a 'Mediterranean' model with regional variation;
- Finland represents the Scandinavian school-based approach;
- Hungary and Poland represent an Eastern European model;
- Ireland belongs to the Anglo-Saxon liberal market economy model.

Economic-Business Framework:
Table on the construction sector and workforce per country p.9 but incomplete data
Table 3. Eurostat Key indicators: construction sector 2015
Table 3. Persons employed in construction by enterprise size in 2015

Importance of the BUS to introduce LEC in to VET in the 7 countries implied in the BUS project, reforms have been implemented:

- A review of the national qualifications framework to align it with EQF (Bulgaria, Hungary, Slovenia);
- The development of national (Italy) and sectoral (Poland) qualification frameworks;
- Initiatives to strengthen work-based learning (Bulgaria, Hungary, Slovenia, Spain);
- The introduction of apprenticeships (Slovenia and Hungary);
- The introduction of mandatory work-placement schemes (Hungary);
- Restructuring of the regulatory framework and governance arrangements (Ireland, Poland, Slovenia);
- Increased autonomy for schools and teachers (Slovenia);
- The introduction of a competence based system (Slovenia).

Similar challenges in implementing VET in the 10 countries:

- Structural features
- unregulated and undeclared activity
- varying qualification levels
- workforce diversity or lack of it
- skill shortages
- rapid technological innovation

Factors enabling and supporting effective training

- social partnership and consultative structures
- levy style funding arrangements for VET
- a relatively highly qualified workforce
- broadly based IVET (initial VET)
- the development of new qualifications and upgrading of existing ones
- the development of CVET (continuing VET) for LEC

Some important trends

- an increasing number of profiles for new LEC related occupations
- an increasing number of existing profiles incorporate LEC elements
- more awareness of relevant inter-occupational interfaces
- more emphasis on transversal abilities
- CVET is critical to equip the existing workforce for LEC/NZEB (nearly zero emission buildings)

Different models for the integration of LEC principles into Construction VET (p.25)

- Common syllabus
- Common curriculum
- Specific (content)
- Sector framework

- Occupational profiles
- Content guidance

What works best for IVET:

- knowledge, know-how and attitudes are spelled out in a way that can be used by curriculum designers
- identify occupational overlaps and build them in where this is deemed to be desirable to achieve better inter-occupational co-ordination. Extending or updating the scope of existing occupations with SQF. For those countries that do not have centralised VET curricula, a more flexible approach is desirable
- the appropriate national, regional or sectoral bodies responsible for drawing up profiles use the Belgian profiles, the *Qualibuild* framework and the Leeds guidelines as a basis for reviewing existing profiles

What works best for CVET:

- LEC is concerned with innovation and the rationale for LEC CVET is to introduce construction workers to these innovations and incorporate them into their practice. APEL procedures on their own are unlikely to guarantee that candidates have acquired the latest knowledge and practices since they are unlikely to have encountered these in their work. APEL can at best only be a component of a LEC CVET qualification.

Low energy construction training contents p.27

Guidelines for VET for LEC: recommended learning outcomes by occupational areas, extracted from the Sustainable Building Training Guide produced by the Leeds College of Building (p.31). The two areas are construction trades and building services engineering trades, both divided into themes which are

- low energy/low carbon building;
- sustainable products;
- waste, reuse and recycling;
- water;
- whole build process

24. Le verdissement des métiers des travaux publics

REPORTS AND STUDIES: Eurostat		
URL	• https://www.constructys.fr/wp-content/uploads/2017/03/Le-verdissement-metiers-TP.pdf	
URL information	• 2013	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	Study realised by the accredited collection organism for constructionin France in 2013 to analyse the greening of Public Works occupations identifying some training needs to achieve the green objectives as the global performance of buildings.	

- Pre-analysis

Six main evolution in the integration of green economy in Public Works in France:

- Biodiversity preservation
- Construction site acceptability
- Waste management
- Primary materials saving and recycling
- Global performance of buildings
- Energy and SEG reduction saving

New qualification demands

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	11	15%
Percentage of completeness		11	15%
Adequacy	Typology of source	17	20%
Percentage of adequacy		17	20%
Total		63	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	

	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation

Training offer to eco-prestation address to execution workers

- Commercialisation of new offers: ecological alternatives, sustainable roads, canalisation renovation…
- Resources saving and recycled materials optimisation
- Developing intelligent networks and systems

Training offer to eco-responsibility

- Understanding and reducing buildings impact on biodiversity
- Construction site acceptability: organising concertation

25. Étude sur les fonctions d'encadrement de chantier du BTP

REPORTS AND STUDIES: Eurostat		
URL	• https://www.metiers-btp.fr/images/documents/publications-et-etudes/encadrement_de_chantier/exe_etude_encadrement_chantier_HD.pdf	
URL information	• 2017	
Typology	Statistics	
	Bibliographic	
	Statement	X

Resume	Study on construction site mentoring occupations in the construction and Public Works sector. It identifies the evolution of competences needs per framing occupation (works conductor, construction site manager, team manager).

- Pre-analysis

New occupations appearing in the sector implying new qualification needs
Emergence of new competences for developing tasks: technical, organisational, social and relational, adaptation competences
Descriptive analysis of the trainings for framing occupations (CVET, IVET and skills and competences)

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
	Percentage of Accessibility	20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
	Percentage of frequency and update	0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
	Percentage of rigour	15	20%
Completeness	Totality, credibility and representativeness	15	15%
	Percentage of completeness	15	15%
Adequacy	Typology of source	20	20%
	Percentage of adequacy	20	20%
	Total	70	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	

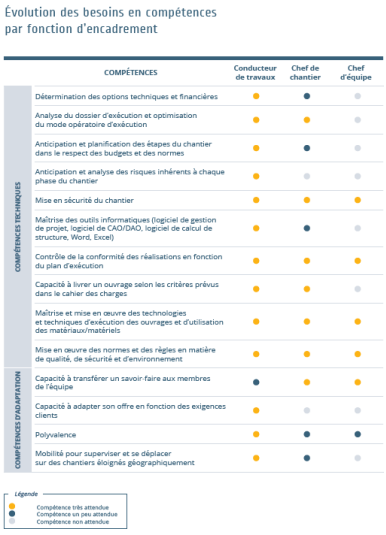
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	X
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	X
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	X
Need and utility of the information provided:		
…		

- Interpretation

Adaptation of CVET and IVET for each framing occupation (team manager, construction site manager, works conductor) and transversal trainings

The technical competences are:

- Identifying technical and financial options
- Anticipation and planification of construction site steps respecting budget and norms
- Anticipation and analysis of inherent risks in each construction site step
- Securing the construction site
- Mastering informatic tools
- Control of realisations conformity depending on execution plan
- …


Évolution des besoins en compétences par fonction d'encadrement

	COMPÉTENCES	Conducteur de travaux	Chef de chantier	Chef d'équipe
COMPÉTENCES TECHNIQUES	Détermination des options techniques et financières	●	●	○
	Analyse du dossier d'exécution et optimisation du mode opératoire d'exécution	●	●	○
	Anticipation et planification des étapes du chantier dans le respect des budgets et des normes	●	●	○
	Anticipation et analyse des risques inhérents à chaque phase du chantier	●	○	○
	Mise en sécurité du chantier	●	●	●
	Maîtrise des outils informatiques (logiciel de gestion de projet, logiciel de CAO/DAO, logiciel de calcul de structure, Word, Excel)	●	●	○
	Contrôle de la conformité des réalisations en fonction du plan d'exécution	●	●	●
	Capacité à livrer un ouvrage selon les critères prévus dans le cahier des charges	●	●	○
	Maîtrise et mise en œuvre des technologies et techniques d'exécution des ouvrages et d'utilisation des matériaux/matériels	●	●	●
	Mise en œuvre des normes et des règles en matière de qualité, de sécurité et d'environnement	●	●	●
COMPÉTENCES D'ADAPTATION	Capacité à transférer un savoir-faire aux membres de l'équipe	●	●	●
	Capacité à adapter son offre en fonction des exigences clients	●	○	○
	Polyvalence	●	●	●
	Mobilité pour superviser et se déplacer sur des chantiers éloignés géographiquement	●	●	○

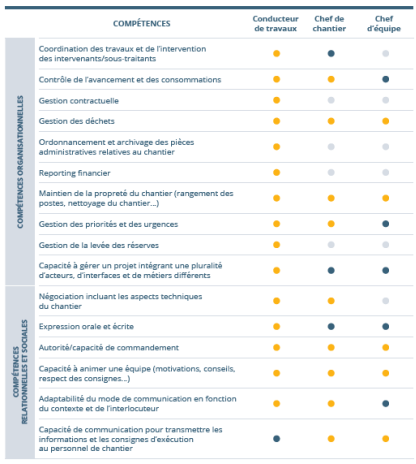
Légende
● Compétence très attendue
● Compétence un peu attendue
○ Compétence non attendue

The adaptation competences are:

- Capacity to transfer know-how to team members
- Capacity to adapt the offer depending on the clients demands
- Polyvalence
- Mobility to supervise and move to geographically distant construction site

The organisational competences are:

- Works and subcontractors coordination
- Contractual management
- Waste management
- Financial reporting
- Priorities and emergencies management
- …



	COMPÉTENCES	Conducteur de travaux	Chef de chantier	Chef d'équipe
COMPÉTENCES ORGANISATIONNELLES	Coordination des travaux et de l'intervention des intervenants/sous-traitants	●	●	○
	Contrôle de l'avancement et des consommations	●	●	●
	Gestion contractuelle	●	○	○
	Gestion des déchets	●	●	●
	Ordonnancement et archivage des pièces administratives relatives au chantier	●	○	○
	Reporting financier	●	○	○
	Maintien de la propreté du chantier (rangement des postes, nettoyage du chantier…)	●	●	●
	Gestion des priorités et des urgences	●	●	●
	Gestion de la levée des réserves	●	○	○
	Capacité à gérer un projet intégrant une pluralité d'acteurs, d'interfaces et de métiers différents	●	●	●
COMPÉTENCES RELATIONNELLES ET SOCIALES	Négociation incluant les aspects techniques du chantier	●	●	○
	Expression orale et écrite	●	●	●
	Autorité/capacité de commandement	●	●	●
	Capacité à animer une équipe (motivations, conseils, respect des consignes…)	●	●	●
	Adaptabilité du mode de communication en fonction du contexte et de l'interlocuteur	●	●	●
	Capacité de communication pour transmettre les informations et les consignes d'exécution au personnel de chantier	●	●	●

The relational and social competences are:

- Negociations including technical aspects on construction site
- Oral and written expression
- Commandement capacity
- Team animator capacity
- Adaptability to different communication modes depending on context and interlocutor
- …

26. Exoskeletons for Industrial Application and their Potential Effects on Physical Work Load

REPORTS AND STUDIES: Eurostat		
URL	• https://pdfs.semanticscholar.org/b38c/5795d943ae8d36f0c1296d63c5f7e7822bf7.pdf?_ga=2.63511919.1313414861.1542096524-514920681.1542096524	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	This paper provides an overview of assistive exoskeletons that have specifically been developed for industrial purposes and to assess the potential effect of these exoskeletons on reduction of physical loading on the body. The effect on physical loading have been evaluated, mainly in terms of muscle activity. All passive exoskeletons retrieved were aimed to support the low back. 10 to 40% reductions in back muscle activity during dynamic lifting and static holding have been reported. Both lower body, trunk and upper body regions could benefit from active exoskeletons. Muscle activity reductions up to 80% have been reported as an effect of active exoskeletons. Exoskeletons have the potential to considerably reduce the underlying factors associated with work-related musculoskeletal injury.	

- Pre-analysis

Exoskeleton could be a solution of the aging population, facilitating physical work in the construction sector. As the structure has been tested, it is still a project for industrial uses. The main use is in the medical sector, or even in the military.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	7	10%
	Percentage of Accessibility	17	20%

Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	8	15%
Percentage of completeness		8	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		60	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	
	New occupations / competencies due to changes in regulations	
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Specific issues include discomfort (for passive and active exoskeletons), weight of device, alignment with human anatomy and kinematics, and detection of human intention to enable smooth movement (for active exoskeletons). Many workers are still exposed to physical workloads due to material handling (over 30 % of the work population in the EU), repetitive movements (63%), and awkward body postures (46 %). In the European Union, yearly more than 40 % of the workers suffer from low back pain or neck and shoulder pain.

Full-automation would solve these. There is a growing movement in modern industry towards human robot collaboration to improve use of robotics while retaining the flexibility of humans. The main benefit is that, specifically in dynamic environments, one will fully profit from the human's creativity and flexibility, while he is the one in charge, and there is thus no need for robot programming or teaching of robots.
An exoskeleton can be defined as a wearable, external mechanical structure that enhances the power of a person. Exoskeletons can be classified as 'active' or 'passive'. The main application area of exoskeletons has been for medical /rehabilitation purposes, but also for military applications. There is still a need to further develop lightweight exoskeletons compatible with operators.

The industrial use of passive and active exoskeletons requires consideration of several specific safety issues. Varying risk scenarios can be defined for the worker wearing an actuated exoskeleton in the occupational field, for example on the shop floors in production industry, in warehouses, in hospitals, or outdoors in agriculture or construction.

27. Improving Construction Safety Using BIM-based Sensor Technologies

REPORTS AND STUDIES: Eurostat		
URL	• https://repositorio-aberto.up.pt/bitstream/10216/111987/2/266242.pdf	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	Construction sites are dynamic and complex environments which makes them difficult to control. Indeed, safety and performance efficiency are often inadequate. Construction industries are relying on new equipment and machinery to keep up with the dense and complex design projects. To cope with the development, new techniques and technologies are being adopted to deal with the rising safety risks. Automated recognition of construction risks using Building Information Modelling (BIM), is being developed and looks promising to manage and minimize accidents. The objective of this research is to show the relation between BIM and construction health and safety. As well highlight some of the sensing techniques and technologies, used with the integration of BIM, that helps with identifying, monitoring, and training workers which may	

	lead to lower on-site accidents. The methodology adopted in this work consisted in the selection of several research papers using a reproducible approach and then a narrative and thematic analysis is performed to evaluate their contents. Several tools have been listed as well as the risks they are targeting. Based on the result of the review it is believed that BIM is rapidly growing around safety. In the future, BIM should be integrated within the start of every project and develop to anticipate threats, to maximize the proficiency and ensure the safety and good performance of workers.

- Pre-analysis

This research demonstrated a literature review of some methods and ideas being used to promote health and safety in construction sites. The start of the research showed that health and safety is a major concern in the construction field and still have a significant number of injuries and fatalities.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	11	15%
Percentage of completeness		11	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		66	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Currently, BIM is just being introduced to be a part of safety and health planning in the construction industry. In the past it was not meant to prevent injuries and save lives of workers, there is a rising interest in improving worksite safety through BIM with safer design and proper constructability methods. BIM is being used for visualization and analysis procedures to improve health and safety programs during the project lifecycle. Even in a complex and dynamic environments BIM provides new tools and technologies, to improve site health and safety aspects in an efficient way. Prevention planning using BIM can be 4D visualization and transferred to all project levels and stakeholders. In addition, to the work space conflicts could be analysed and prevented in earlier stages and avoid collisions according to construction schedules

Major areas where Safety and Health professionals can use BIM:

- Safety training,
- safety planning,
- pre-task planning,
- job hazard analysis,
- site equipment planning,
- design for safety and
- accident investigations.

BIM-based prevention through design (PtD) and designing for efficiency and optimization. Before material installation BIM is used as a 4D model to review the installations for any further risks or accidents to be prevented. Monitoring the site using sensors could decrease the manual monitoring, a centralized data

base could be used to store data and retrieve them whenever needed, that will help to take necessary actions and planning.

BIM is still facing some limitations:

- BIM being an immeasurable tool,
- benefits that are related to any phase other than the design phase is hard to assess,
- project managers also consider BIM as money and time.

BIM requires:

- model familiarity and good modelling skills,
- as well understanding the model and relate schedules and components,
- as well the person developing the model should also be familiar with the safety regulations and requirements.
- Furthermore, the models need to be detailed and having all necessary safety information for safety planning and checking, lacking these details will prevent identifying risks.
- In addition, still BIM is considered hard to use and for subcontractors, site workers and foremen they might be uncomfortable using it and they rather stick to the traditional 2D drawings instead.
- As for health and safety professionals, access to BIM models could be limited and the technical skills and tools to use the model are not yet in place. BIM is still not able to fully simulate the construction process, and still rely on manual assistance, as an example changes in the construction site were hazards arise might suddenly occur for workers, BIM do not simulate the rapid changes.
- Some accidents are still not able to be fully covered with BIM, for example operating from heights, machinery operation, personnel safety management.
- Nevertheless, BIM technology requires a high level of inter-organizational coordination. This coordination must be flexible in technological structure, secure, easy system to use and cost-effective. This is more effective and beneficial if and only if both parties adopt 3D CAD system, also either they use the same software, or any software which follows same standards.

Assisting BIM system by sensing tools improved the safety status but still most of the location tracking system do not gather accurate indoor data. As well as some sensors loose connection in underground or tunnel works where Wi-Fi is not available. The sensing technologies still rely on heavy infrastructure. In addition, the implemented system creates additional efforts to safety manager such as attaching Tags, analysing data and training individuals. Results of the research also shows that sensor data may provoke false alarms and may cause inaccurate reading of sensing subsystem. Most of the sensing devices that relies on batteries have energy deficiency and cannot be continuously used for monitoring.

Future research will be necessary in several areas, for implementing BIM and making it reliable a validation strategy must be done and standardized in terms of performance, cost, field monitoring, risk recognition, and work interruptions. In addition to a measurable metric technique that will clearly show the benefits of BIM. Safety rule checking should be developed more till it be possible to influence a more complex and dynamic construction environment. Research in BIM should be widened to target more safety issues other than falls, moving vehicles, ungraded edges and holes, and temperature related threats. Research should also focus on developing high level of the detail to safety elements, as well making a stand razed format to facilitate data exchange.

28. Innovative solutions to safety and health risks in the construction, healthcare and HORECA sectors

REPORTS AND STUDIES: Eurostat	
URL	• https://osha.europa.eu/en/tools-and-

	publications/publications/reports/innovative-solutions-OSHrisks	
URL information	• Online. European Agency for Safety and Health at Work, 2011	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	The report underlines four risk categories in the construction, healthcare and HORECA sectors. It identifies the main risk factors in each category for the three sectors and gives ideas for solutions.	

- Pre-analysis

See interpretation.

- Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	11	15%
Percentage of completeness		11	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		66	**100%**

- Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	
	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	X
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

Risk categories	Main risk factors	Solutions
Psychosocial load	• Time pressure and deadlines • Undeclared work • Low control • High demands (physical workload) • Training (or lack thereof) • Job certainty • Safety climate • Skill under-utilisation • Responsibility for safety of others • Safety compliance • Hours of exposure • Tenure • Harassment/discrimination • Lack of communication • Posture • High turnover • Unsafe work practices	• Ergonomic interventions and mechanisation aides for bricklayers • Implementation strategy and training on new working methods for floor layers • Use of a hydraulic ladder rack for all maintenance workers • Mechanical aids for plasterers • Use of prefabricated steel and self-compacting concrete • Mechanisation aids for road workers and floor layers • Use of alternative methods for pile cropping
Physical load	• Accidents • Manual handling of (heavy) loads • Work environment (e.g. not enough	• The risk management framework for work-related stress • Increasing construction workers' use

	room, uneven or slippery floor, cold) • Awkward postures (e.g. stretched arms, bent postures, kneeling and squatting) • Working above shoulder/head level • Repetitive work 'e.g. hammering, drilling, driving screws, sawing, painting with brushes, plastering, cutting sheet metal with scissors, loading and unloading small pieces like tiles or bricks) • High force applications • Vibration • Local compression of tools and surfaces • Psychosocial factors	of hearing protection devices • A job safety programme using tool box training sessions and computer-assisted biofeedback stress management techniques • Improving lifestyle among male construction workers at risk for cardiovascular disease • Reducing the level of sickness absence by organising healthier work • Working well together campaign to improve health and safety • Worker engagement decision tool • Achieving behavioural change by the TASK card and other means • Better health under construction through a supportive national framework • Organisational health management interventions to improve work life balance
Slips, trips and falls*	Falling from heights • Working on scaffold or platform without guard rails, or without a safety harness correctly attached • Working on fragile roofs and ladders that are badly maintained, positioned and secured	• Information for training/toolbox talks on the use of Mobile Elevating Work Platforms
Dangerous substances	(varies with size, exposure) • Tunnel construction • Demolition • Renovation	• Dibasic esters can replace dichloromethane in paint strippers • OSH preventing solutions for fire accidents • OSH preventing solutions during the painting processes • OSH preventing solutions during the welding processes • OSH preventing solutions during work with spray polyurethane systems • Dust-free construction materials reduce inhalable dust concentrations • Dust free sanding of wood • Innovative application solution to prevent skin contact with epoxy resin • Use of warm mixed asphalt to reduced exposition to fumes and aerosols

*Tasks carried out in specific construction jobs

- plasterers, including plaster spraying
- pointers, when filling joints between bricks
- screeders making floors level (and exposed to vibration, pulling mechanic tools, manual spreading)
- scaffold erectors

- tilers
- carpenters, when working above shoulder level
- glaziers, manual handling, kit cutting, applying kit
- bricklayers, especially when handling large blocks
- insulation workers, when applying mineral wool or polystyrene
- plumbers
- architects' staff, undertaking Computer Aided Design (CAD)
- paviours, carrying out repetitive movements, handling heavy materials, and using vibrating equipment.

29. Green jobs and occupational safety and health: Foresight on new and emerging risks associated with new technologies by 2020

REPORTS AND STUDIES: Eurostat		
URL	• https://osha.europa.eu/fr/tools-and-publications/publications/reports/summary-green-jobs-and-occupational-safety-and-health-foresight-on-new-and-emerging-risks-associated-with-new-technologies-by-2020/view	
URL information	• Summary of the global report (2013)	
Typology	Statistics	
	Bibliographic	
	Statement	X
Resume	This document summarises the project 'Foresight of new and emerging risks to occupational safety and health associated with new technologies in green jobs by 2020', carried out for the European Agency for Safety and Health at Work (EU-OSHA) by a consortium of the United Kingdom's Health and Safety Laboratory, SAMI Consulting and Technopolis Group. It synopsises a longer report (EU-OSHA 2013) that gives more detail on the methodology and findings.	

- Pre-analysis

The outcome of the project is a set of scenarios covering a range of new technologies in green jobs and the impact they could have on workers' health and safety.

There are several definitions of the "green jobs"

Key technology innovations are:

- green construction technologies with energy-efficiency measures (examples: new build and retrofit, renewable energy, new techniques, increasing use of ICT and robotics and automation),
- green manufacturing technologies and processes, including robotics and automation with advanced manufacturing techniques, distributed manufacture, lean methods, biotechnologies, green chemistry, nanomaterials

- nanotechnologies and nanomaterials with a very wide range of potential applications including materials used in construction (for instance, pavements/bricks/asphalts 'capturing' environmental pollutants, nanocoatings/nanopaints transforming solar energy into electricity, 'green' anti-fouling nanocoatings).

These three scenarios are:

- win-win: high economic growth, strong green values, high innovation in green technologies
- bonus world: high economic growth, weak green values, medium - innovation in green technologies
- deep green: low economic growth, strong green values, medium + innovation in green technologies

■ Coding

ANALYSIS OF RELEVANCE OF THE SOURCE			
INCLUSION CRITERIA	**INDICATOR OF RELEVANCE**	**% value**	**% value (maximum)**
Accessibility	Degree of openness	10	10%
	Localisation	10	10%
Percentage of Accessibility		20	20%
Frequency and update	Frequency	0	10%
	Updating	0	15%
Percentage of frequency and update		0	25%
Rigour	Origin and impact	10	10%
	Systematisation	5	10%
Percentage of rigour		15	20%
Completeness	Totality, credibility and representativeness	11	15%
Percentage of completeness		11	15%
Adequacy	Typology of source	20	20%
Percentage of adequacy		20	20%
Total		66	**100%**

■ Categorisation

SOURCE INFORMATION INDICATORS		
Type	**INFORMATION about**	
Current economic situation	Job market	
	National economic situation	
	Economic conjuncture autonomous community, county, municipal	

	Training for employment national data	
	Training for employment autonomic, regional, municipal data	
Employment needs	Evolution of activity sectors	
	New concerns	X
	Sectors that generate employment	
	Occupations that generate employment	
Needs derived from the changes	New occupations / competencies due to changes in demand	
	New occupations / competencies due to technological changes	X
	New occupations / competencies due to changes in regulations	X
	New occupations / competences due to changes in costs	
	New occupations / competencies due to changes in the market	
Need and utility of the information provided:		
…		

- Interpretation

The 'Foresight of new and emerging risks to occupational safety and health associated with new technologies in green jobs by 2020'[1] summarizes impacts that new technologies in green jobs would have on occupational health and safety by imagining three scenarios of greening.
Key technology innovations directly linked to construction are:

- green construction technologies with energy-efficiency measures (examples: new build and retrofit, renewable energy, new techniques, increasing use of ICT and robotics and automation);
- green manufacturing technologies and processes, including robotics and automation with advanced manufacturing techniques, distributed manufacture, lean methods, biotechnologies, green chemistry, nanomaterials;
- nanotechnologies and nanomaterials with a very wide range of potential applications including materials used in construction (for instance, pavements/bricks/asphalts 'capturing' environmental pollutants, nanocoatings/nanopaints transforming solar energy into electricity, 'green' anti-fouling nanocoatings).

The use of these rapidly evolving technologies reinforce the high need of training systems in order to work with qualified workers. The risk of skill shortages due to these rapid changes is high. In fact, the high demand in (qualified) workers will have two impacts which are the employment of unqualified workers unaware of the new risks and a greater polarisation of the workforce by a highly competitive highly qualified workforce leading low-skilled workers to work in poor working conditions. Plus, there is a high need of monitoring these new technologies over their lifecycle in order to understand and prevent unknown health and safety risks.

- Scenarios and workers' health and safety impacts
  - Win-Win scenario

The win-win scenario includes high economic growth, strong green values and high innovation in green technologies. In more details, this means that:

[1]Green jobs and occupational safety and health: Foresight on new and emerging risks associated with new technologies by 2020 https://osha.europa.eu/fr/tools-and-publications/publications/reports/summary-green-jobs-and-occupational-safety-and-health-foresight-on-new-and-emerging-risks-associated-with-new-technologies-by-2020/view

- new buildings are zero carbon and external insulation of existing buildings in order to reduce the carbon footprint,
- photovoltaics are integrated into buildings or painted
- hyper-insulating materials are in use,
- buildings can be disassembled and recycled,
- modular prefabricated buildings are the norm,
- buildings interact amongst themselves and the smart grid.

According to these changes, the impacts on workers' health and safety are:

- exposition to hazards from old building demolition;
+ improved onsite safety by automated construction of modular buildings offsite;
- workers are exposed to novel substances increasingly used in construction material;
- issues linked to the mixing of automated activities with manual ones;
- risks during connection of services (water and electricity) with the pre-fabricated modules;
- electrical risks as old and new buildings have to be integrated into the smart grid;
- increasing underground congestion with the increase of basements construction;
- new hazards and unexpected accidents linked to the use of new energy sources;
- risks of falls or exposure to lead and asbestos by the increasing roof work linked to old buildings retrofitting.

▪ Bonus world scenario

The bonus world scenario includes high economic growth, weak green values and medium - innovation in green technologies. In more details, this means that:

- most new buildings are prefabricated modular designs with increased automation in assembling and retrofitting,
- most old buildings are demolished and demolition waste are not recylced,
- high levels of insulation are the norm,
- photovoltaics are integrated into buildings,
- buildings are not designed for recycling,
- subcontracting is used to drive down costs.

According to these changes, the impacts on workers' health and safety are:

- exposition to hazards from old building demolition;
+ improved onsite safety by automated construction of modular buildings offsite;
- workers are exposed to novel substances increasingly used in construction material;
- increasing underground congestion with the increase of basements construction;
- risks of falls or exposure to lead and asbestos by the increasing roof work linked to old buildings retrofitting;
- attraction of unqualified workers for indoor ventilation as the demand in insulation retrofitting is high.

▪ Deep green scenario

The deep green scenario includes low economic growth, strong green values and medium + innovation in green technologies. In more details, this means that:

- limited construction of new buildings and high proportion of recycled materials,
- retrofitting homes to new standards is the norm,
- governmental regulations and controls limit buildings' energy consumption.

According to these changes, the impacts on workers' health and safety are:

- exposition to hazards from old building refurbishment,
- height risks, electrical risks, dust and hazardous chemicals exposition linked to retrofitting of renewable energy technologies;

- attraction of unqualified workers for indoor ventilation as the demand in insulation retrofitting is high.