DELIVERABLE: D5.1

Title: Comparative analysis of roadmaps and overview of international activities

Authors: Andrej Slančík (SIEA), Petr Zahradník (CZGBC), Jiří Karásek (SEVEn)

Build up Skills (BUS) initiative in CZ and SK –

Rebooting the National qualification platforms and Roadmaps towards implementation of nearly Zero Energy Buildings and support for Renovation Wave

Project Number: 101077450

DoubleDecker

Date of delivery: 03/2024

Co-funded by the European Union

Project coordinator:
SEVEn, The Energy Efficiency Center z.ú.
Americká 17, 120 00, Praha 2, Czech Republic
+420 224 252 115 https://database.craftedu.eu/

Co-funded by the European Union

This project has received funding from the European Union's LIFE programme.
Project No. 101077450 — LIFE21-CET-BUILDSKILLS-DoubleDecker

Disclaimer

Further information

More details on BUILD UP Skills can be found at www.build-up.ec.europa.eu

More details on the LIFE CET programme can be found at https://cinea.ec.europa.eu/programmes/life_en

Contents

1. Executive Summary 5

2. Active participation in EU exchange meetings 6

3. Peer review activities 7

3.1. Cooperation process and choosing the sister countries 7

3.2. Sister countries Status Quo analyses 8

3.2.1. General conditions and Status Quo Analysis - Poland 8

3.2.2. General conditions and Status Quo Analysis - Bulgaria 13

3.2.3. General conditions and Status Quo Analysis – Lithuania 16

3.3. Comparison among selected countries 19

3.3.1. Summary – Czech Republic 20

3.3.2. Summary – Slovakia 21

3.3.3. Summary – Poland 23

3.3.4. Summary – Bulgaria 24

3.3.5. Summary – Lithuania 25

3.4. Comparison conclusion - common aspects of the comparison among the chosen countries 26

4. Participating in sister project events 29

5. Observation and information exchange 30

5.1. General information about Czech and Slovak Status quo analyses 30

5.1.1. Summary of Czech Status quo analysis 30

5.1.2. Summary of Slovak Status quo analysis 31

5.1.3. Comparison of Czech and Slovak Status quo analyses 32

5.2. General information about Czech and Slovak Roadmaps 32

5.2.1. Summary of Czech Roadmap 32

5.2.2. Summary of Slovak Roadmap 33

5.2.3. Comparison of Czech and Slovak Roadmaps 34

5.3. Measures proposed in Roadmaps 35

5.3.1. Measures of Czech Roadmap 35

5.3.2. Measures of Slovak Roadmap 35

5.3.3. Comparison of measures proposed in Czech and Slovak Roadmaps 37

5.3.4. New structure of professions in construction industry 38

5.3.5. Identified barriers 40

5.3.6. Comparison of Czech and Slovak Roadmaps from the perspective of identified barriers 42

6. Conclusions 43

1. Executive Summary

This report summarises activities related to project international activities, EU Exchange, and peer review activities among chosen countries. Thus, main parts contain comparative analyses of Roadmaps and overview of international activities.

Before the Roadmaps have been completed, their creation processes had been monitored and discussed both among Czech and Slovak partners since very beginning of the project and within other out-of-project countries in later stage. International communication and information exchange are crucial parts of the work.

International experience and knowledge exchange contributes to quality keeping of both the Status Quo Analysis (SQA) and the Roadmap. Earlier set objectives of the comparative analyses and European level experience exchange are:

- To bring national topics to the EU audience
- To compare status quo analysis and the Roadmap internationally
- To benefit from synergies of 15 planned project
- To propose EU-wide-impact measures

2. Active participation in EU exchange meetings

The 14th BUILD UP Skills European exchange meeting took place on 28-29 November 2022 online. Representatives of the DoubleDecker project consortium leader and work package leader were present at this call. As this meeting took place at the very beginning of the project works, gained experience helped shape following discussions early before works on the status quo analysis.

The project was presented also at 15th BUILD UP Skills European exchange meeting held in Brussels, 26 – 27th October 2023. Project representatives actively participated in plenary and breakout sessions, where presented Draft Roadmap in both project countries and agreed on cooperation with other BUS projects.

The DoubleDecker project was presented at the international exchange meeting: Meeting of the LIFE BUILD UP Skills national projects: reviewing progress on the Status Quo Analysis (SQA) drafting, March 30, 2023, 10:00 – 16:30, (online). The partners of the DoubleDecker project presented their results in two groups during the meeting, Group A (Slovakia) and Group C (Czech Republic). Each team presented the overall project approach to conducting SQA data collection; described the key data you collected and highlight the specific issues and difficulties they encountered in the process.

3. Peer review activities

The main goal of the peer review activities is to compare, get inspired, keep quality and potentially find synergies. During the project, systemic and continuous collaboration has been established between Czech and Slovak partners. Specifically, peer review activities leading to comparison and experience exchange-based cooperation have been set with other chosen so-called sister countries.

3.1. Cooperation process and choosing the sister countries

Choosing sister countries has been based on a common discussion about relevant parameters that shall be taken into account. The following table shows preliminarily identified six countries and the parameters discussed.

Table 1. Assessment of parameters identifying the selected sister countries

parameter / country	Poland	Bulgaria	Lithuania	Austria	Hungary	Croatia
Geographical vicinity – markets connection	5	3	1	5	3	2
Similar history	4	3	3	2	3	1
Generally different conditions and approaches – potential of new views and inspiration	2	3	4	4	2	3
Existing similar roadmaps and relevant strategies						
Similarity of school systems						
total	11	9	8	11	8	6
to be involved into peer review	Yes	Yes	Yes	No	No	No

The geographical vicinity of countries is important for most industry market actors – mostly manufacturers and construction companies. Similar historical development predicts similarities in general societal conditions and public opinion and thinking. On the other hand, different conditions and approaches can bring significantly different ideas and thus inspiration. When seeking different strategies and existing roadmaps, there was not any important argument as pros or cons. In the case of educational systems as well.

When commonly agreed on the weights of each item in the table, we have selected Poland, Bulgaria and Lithuania (PL, BG, LT) for further cooperation and detailed peer review.

On 11th December 2023, there was the first common online call among DoubleDecker partners and representatives of PL, BG and LT. On the mentioned call, the following representatives took part:

Czech Republic: Petr Zahradník (CZGBC) Czech Green Building Council and
Jiří Karásek (SEVEn), The Energy Efficiency Center

Slovakia: Andrej Slančík (SIEA), Slovenská inovačná a energetická agentúra

Poland: Piotr Zdanowski (KAPE), Krajowa Agencja Poszanowania Energii S.A.

Bulgaria: Dragomir Tzanev (EnEffect), Center for Energy Efficiency EnEffect

Lithuania: Vaidotas Šarka, Lithuanian Builders Association

The voice record of this call is available for internal purposes. Additional bilateral calls and written communication followed and served as a base for the following comparison, which contains information from presentations, Status Quo analyses (SQA) and other information received from the sister countries partners. Due to different deadlines of the Build Up Skills (BUS) Projects, the Roadmaps of these countries were not available before the deadline for this report.

3.2. Sister countries Status Quo analyses

The summary of the SQAs of BG, PL and LT reflects the date of writing this document. SQAs are available in final versions. Roadmaps are not available even in draft versions for all three countries, because they are under broad discussion and are being significantly updated. Besides the Roadmaps drafts, presentations that partially substitute the missing Roadmaps are available. They are used for setting the recommendations and following a comparison of approaches.

This chapter is composed of Status Quo Analyses of Poland, Bulgaria and Lithuania and contains parts from these respective reports of the partnering countries. The summary and detailed review of the Czech and Slovak SQAs and Roadmaps are described in chapter 5.

3.2.1. General conditions and Status Quo Analysis - Poland

The Polish report contains:

0. Executive summary
1. Introduction
2. Objectives and methodology
3. National policies and strategies to contribute to the EU 2030 energy targets in buildings
4. Key data on the building and energy sector
5. Existing provisions in the field of Education and Training
6. Relevant building skills projects
7. Skills gaps between the current situation and the needs for 2030
8. Barriers
9. Conclusions

10. Authors/contributors
11. References
12. Glossary

Main Polish strategic documents that are reflected and influences significantly present and future needs of the construction sector are:

- Polish Energy Policy until 2040;
- Long-Term Building Renovation Strategy;
- Distributed Energy Development Strategy in Poland until 2040;
- National Energy and Climate Plan for 2021-2030.

The report mentions annual increases in housing construction between years 2018-2022 with the dominance of traditional improved building construction technology. Central heating from the network was observed in 35.4% of apartments commissioned in 2022. The most common types of individual heating were boilers using natural gas (63.0%), solid fuel (21.4%), electricity (9.0%).

After the collapse of the construction market during the COVID-19 pandemic, the economic situation is currently improving, however, due to the economic situation, 36.9% of construction companies are postponing investment decisions, and 27.7% are planning to reduce employment.

In Poland, professions operating in vocational education and where the curricula incorporate energy-saving and low-emission construction are:

- Renewable energy equipment and systems technician;
- Roofer;
- Roofing technician;
- Industrial insulation technician;
- Refrigeration and air conditioning technician.

In other professions in the construction and energy sectors, there was no direct presence of relevant learning parts leading to the development of skills in respective areas of energy-efficient and low-emission construction. Conclusion is the necessity to verify the curricula.

Universities provide educational content in the areas of energy efficiency and low emission, mainly in the field of "Construction" and in the field of "Renewable energy sources".

The offer of trainings and courses from the first half of 2023, related to energy efficiency and low emission in construction, have been identified as rich and sufficient.

On the other hand, it was found that topics like renewable energy sources and low-emission construction are not present in the lists of accredited non-school forms of continuing education. There is an insufficient number of market qualifications as well (only 3 qualifications)

related to energy efficiency and low-emission in construction, included in the Integrated Qualifications System.

In the years 2014–2022, the Office of Technical Inspection issued a total of 8,626 certificates for installers of renewable energy sources. At the end of 2022, the Office of Technical Inspection had 63 training companies in its registers that were accredited by the President of the Office of Technical Inspection to conduct training for installers of renewable energy sources.

Based on the research carried out in the project, the education system generally is quite well prepared for developing skills in the areas of renewable energy sources, energy efficiency of construction and the integration of renewable energy sources with efficient heating and cooling technologies. The worst prepared is for the areas of impact assessment related to emissions and the greenhouse effect.

As the most important skills that should be included in education and training programs from practical point of view are:

- installation and operation of heat pumps;
- installation and operation of a photovoltaic systems;
- digitization of the investment and construction process.

The largest gaps in 2030 are expected in the following areas:

- skills related to circular construction, efficient resource management, sustainable construction framework - level(s) framework;
- the ability to carry out deep renovation of buildings, including through modular and industrialized solutions;
- skills related to determining carbon dioxide emissions throughout the life of a building (carbon footprint) by assessing the greenhouse effect potential (Global Warming Potential GWP).

Following areas have to be taken into account:

- lack of qualified staff in the construction industry especially at the lower levels and especially in the context of the challenges of the Long-Term Building Renovation Strategy;
- poor cooperation between enterprises and universities and vocational schools;
- unpopularity of construction professions, including professions related to energy efficiency issues, both among students who are potential employees, as well as among teaching and instructor staff;
- lack of support for construction companies accepting trainees and apprentices on construction sites and lack of a system motivating employers to participate in the training of construction staff;

- low number of validations of skills acquired informally, through experience on a construction site, e.g. as part of acquiring market qualifications in the Integrated Qualifications System;
- lack of development of online education in the form of e.g. mass, open Massive open online courses (MOOCs) of professional skills, often ending with micro-credentials of acquired learning outcomes, at all levels of the Polish Qualifications Framework;
- lack of issues in education and training programs regarding the calculation of the carbon footprint, e.g. in the entire life cycle of a building, as well as the carbon footprint of thermal modernization materials in order to select them in order to minimize the energy consumption of insulation systems and reduce CO_2 emissions;
- lack of people with the skills and knowledge of energy management in the building and synchronizing renewable energy systems with advanced ventilation and heating systems, combined with setting up and servicing intelligent building control systems (Smart Building).

Barriers to skill development

According to data from the Central Statistical Office, the shortage of qualified employees is a significant barrier to the operations of enterprises. In July 2010, the shortage of qualified employees was a barrier for 18% of enterprises, and currently (July 2023) it is a barrier for 34.5% of enterprises, with the size of the enterprise not having much importance here.

In the study conducted as part of this project, respondents (n=504) indicated the 20 most important barriers in education and training (vocational education, higher education, continuing education) limiting the development of energy-saving and low emission construction staff (order from the largest number of indications):

1. Insufficient supply of qualified employees on the construction labour market (staff shortages);

2. Too little emphasis on acquiring practical skills in education and training for the needs of the construction industry;

3. Lack of an attractive job offer (e.g. salary) for qualified workers in the construction industry;

4. Poor preparation of teaching and training staff for education in accordance with the requirements of modern construction work positions;

5. Lack of cooperation between vocational schools and employers in the construction industry (e.g. dedicated training, trips, observations, apprenticeships, internships, learning under the supervision of experienced employees, recruitment after graduation);

6. Lack of interest in a career in the construction industry among young people (aging staff);

7. Lack of incentives, promotion and support on the part of state and local authorities to rebuild the position of construction schools and the prestige and ethos of construction professions;

8. Rigid, inefficient, long-term forms of training construction staff, incompatible with the needs of modern construction and society;

9. Lack of internal training in construction companies;

10. Insufficient preparation of graduates of vocational schools and universities to perform even simple professional tasks;

11. Lack of promotion and support (e.g. through public funding) for the continuous development of lifelong learning for construction workers with various years of experience;

12. Vocational education and training programs that do not meet the requirements of modern construction jobs;

13. Lack of participation of construction company employees in national and industry personnel certification systems;

14. Lack of campaigns in traditional, online, industry and social media (graphics, films, influencers' productions) targeting specific age groups and specialties in the construction industry;

15. Failure of the education system to meet the demand of the construction labour market for skills in the area of ecological technologies and applications of renewable energy sources (RES);

16. Lack of a mechanism for employers and construction industry organizations to notify educational institutions of the need for specific competencies and qualifications;

17. Lack of need for construction industry employees to constantly develop competences by participating in training, courses and using advice (mentoring) from more experienced employees;

18. Failure to obtain information from construction industry employees about their educational needs and gaps in qualifications and competences;

19. Lack of research into the training needs of employees and systematic monitoring of the competence needs of the construction industry at the national, regional and local level;

20. The marketing activities of construction companies fail to demonstrate the advantages of having high-quality, qualified staff.

3.2.2. General conditions and Status Quo Analysis - Bulgaria

The report contains:

0. Executive summary
1. Introduction
2. Objectives and methodology
3. Characterization of the building sector
4. National policies and strategies to contribute to the EU 2030 energy and climate targets in buildings
5. Key data on building and energy sectors
6. Existing provisions in the field of vocational education and training
7. Relevant building skills projects
8. Skills gaps between the current situation and the needs to 2030
9. Barriers
10. Conclusions
11. Authors/contributors
12. References
13. List of abbreviations

Skills gaps between the current situation and the needs to 2030

According to the Economic Analysis of the Construction Sector for 2022 in Bulgaria, the average number of registered persons in construction for 2022 is 198.2 thous. people, which represents an increase of 1.2% on annual basis. There are 156.1 thousand employed persons, and 42.1 thousand self-employed persons.

The unemployed in the construction sector for 2022 are 12.9 thousand, or 9.2% of the total registered unemployed. Compared to 2021, the data show that the unemployed in the construction sector decreased by 1.5 thousand or by 10.4%. Other sources demonstrate different data, making it difficult to determine an accurate indicator for forecasting purposes. For example, the analytical report of the Ministry of Labor and Social Policy "Mid-term and long-term forecasts for the development of the labor market in Bulgaria" works with other data.

The secondary education system shows general decrease in the number of those who have acquired professional qualifications is noticed, as well as the practical elimination of certain important specialties, e.g. insulations in construction, windows and glazing and exterior

cladding and flooring are almost unadmitted. Thus, increasing role of vocational education and training centers that try to fill these gaps through the continuing professional qualification system, will be evident.

There is significant difference between the number of students (in a general four-year plan) and the number of graduates in the second qualification level, which means that there are a large number of students who drop out or students who cannot defend their professional qualification. To a lesser extent, this also applies to the third degree of professional qualification, which means that there is no small reserve for increasing the number of qualified workers.

Similar trends are also observed among students and graduates of vocational education in the field of technical sciences, although there it is difficult to separate the specialties related to the energy efficiency of buildings.

The goals set by the Roadmap developed in 2013 have not been achieved and the difference is significant and can hardly be compensated by those who received a qualification in a profession or a part of a profession from the national qualification system, also giving the aging and dropping out of a significant part of the working force.

Training in the system of higher education in Bulgaria

It can be concluded that those who obtained a bachelor's or master's degree in 2022 are twice as few as in 2012 in all specialties related to building renovation and energy from renewable sources. Specifically, for the 2012-2022 period under review, a total of 6,699 students earned bachelor's or master's degrees in architecture and construction majors, which are traditionally some of the most preferred majors. In 2012, there were 748 students who graduated, while in 2022 they were twice as few - 345 students. It should be noted that within the considered period, between 2013 and 2015, graduates exceeded 800 people per year (2013 - 871 graduates, 2014 - 879 graduates, 2015 - 835 graduates). In 2016, the number of graduates reached 694 and in the following years until 2022 it decreased at a steady pace.

A total of 1,806 students obtained bachelor's or master's degrees in specialties related to heating, ventilation, air conditioning, heat energy and heat engineering for the period 2012-2022. In 2012, the number of graduates was 261 students, while in 2022, the number of graduates decreased almost three times - 97 graduated. The number was the lowest in 2020, when only 77 students graduated. For the considered period 2012-2022, the most graduates were the "Heating Engineering" major - 982, followed by the "Heating Power Engineering" major graduates - 358, and in third place was the "Heating, Ventilation and Air Conditioning" major - 248 graduates.

Emerging skills

The emerging skills related to raising and upgrading the qualifications of construction workers can hardly be predicted in the medium term, as they are directly dependent on the

development of technologies and market trends. With a great deal of certainty, it can be claimed that the knowledge of applying innovative energy-efficient solutions, as well as solutions for the integration of RES in buildings, are increasingly prevalent in the national education system. However, largely due to the small number of new entrants to the profession, demand is still high, with meeting the new higher requirements for the energy performance of buildings a particular challenge.

Barriers

Numerous barriers related to the qualification of construction workers have been identified, which hinder the expected development and may prevent the achievement of the 2030 goals in the construction/building sector in Bulgaria. It is quite possible that these barriers are due to the specifics of the market or the political climate, and it is almost impossible to offer a coherent framework: many of these problems overlap and affect, albeit to varying degrees, construction firms and professionals, vocational education specialists, manufacturers and suppliers of construction products and technologies, politicians, etc. However, for a better organization of the results of the analyses, an example summary scheme of the main challenges is proposed.

Barriers in the construction sector:

- Impact of Covid and other global events;
- Lack of a coordinated labor policy and qualified workforce;
- Lack of educational culture and motivation;
- Low prestige of the profession and insufficient pay;
- Lack of sufficient experience and good practices in the construction of high energy and low emission buildings;
- The slow entry and adoption of new technologies and processes;
- Access to trainings.

Market barriers:

- Lack of interest in investments in buildings with almost zero energy consumption;
- Increasing the cost of the project;
- Inaccessibility of the market for new technologies, materials and products.

Political barriers:

- Unstable overall political environment;
- Outdated legislative and regulatory framework;
- Lack of sustainable financial models for low-energy new buildings and renovations;
- Quality Assurance and Evaluation.

Barriers in the vocational education and training system:

- Insufficient facilities and equipment, lack of funding;

- A small number of qualified teachers and an unfavorable age structure;
- Access to training of trainers;
- Practical trainings;
- Unattractiveness of technical professions, lack of adequate professional guidance;
- Lack of supporting funding for training for companies;
- Non-existent system for continuing professional development.

Conclusions

The construction and vocational education and training sectors have the necessary potential to provide the services required of them for the fulfillment of the goals set in the Integrated Plan in the area of Energy and Climate of the Republic of Bulgaria 2021-2030 and the Long-term National Strategy to Support the Renovation of the National Building Stock of Residential and Non-Residential Buildings until 2050.

However, this does not mean that the capacity is there and that the resources are secured: in order to fulfill the objectives, immediate measures must be taken to overcome the identified barriers and existing gaps both in terms of the number of employees and in terms of the level of qualification of the staff.

There is stagnation and even a decline in the demand for training and qualification services both for middle executive personnel in professions related to the energy efficiency of buildings, and for highly qualified personnel. The only exceptions in this area are the immediate processes related to the market demand for energy audits and for RES installations.

In order to achieve rapid progress in the transformation of the building stock, a much more systemic approach is needed, leading to a tangible change in building design and practices and improving existing construction skills for the quality implementation of nearly zero-energy / net zero-emissions buildings, in which the integration of renewable energy sources will be a top priority not only because of the common political goals, but also because of its economic efficiency.

A sustainable process of increasing knowledge and skills can only be expected if there are stable markets that direct the demand of the interested parties, and for this to happen there are very few conditions for the time being.

From a structural point of view, undoubtedly the most important conclusion of the analysis is that new institutional solutions are needed for better monitoring and forecasting of qualification needs in the short and medium term.

3.2.3. General conditions and Status Quo Analysis – Lithuania

The report consists of:

1. Executive summary

2. Introduction
3. Objectives and Methodology
   3.1. Objectives
   3.2. Methodology
4. The National Policies and Strategies to Contribute to the 2030 EU Energy and Climate Targets in the Construction Sector
   4.1. The national policies and strategies on energy and renewable energy resources
   4.2. The national policies and strategies on continuous teaching/learning
   4.3. The national policies and strategies on the digitalisation of the construction sector
   4.4. The national policies and strategies on smart buildings (including e-mobility)
   4.5. The national policies and strategies on circular construction
   4.6. The national policies and strategies on green procurement
   4.7. The links between the national policy measures and competence areas relevant to sustainable construction
5. Key Indicators of Building and Energy Sectors
   5.1. Overview of the statistics of the key indicators of the Lithuanian construction sector in 2013–2022
   5.2. Building construction volumes
   5.3. Statistics of the sector of the existing buildings
   5.4. Nearly zero-energy buildings (NZEB)
   5.5. Dynamics of building certification
   5.6. Energy consumption in the building sector
   5.7. Analysis of the professions employed in the sector
6. Existing Situation in the Field of Education and Training in the Construction Sector
   6.1. Background
   6.2. The vocational education and training system for construction specialists
   6.3. The system of higher education of construction specialists
   6.4. Certification of construction specialists
   6.5. Informal education and training: training offered by providers of non-educational services
7. Relevant Building Skills Projects
8. Competences and Skills Gaps Between the Current Situation and the Expected Needs for 2030
   8.1. Analysis of the Need for Workforce to Achieve the 2030 Targets
   8.2. Forecast of the Demand for Competences and Skills
   8.3. Forecast of the needed volumes of training and qualifications development
9. Forecast of the need for monitoring measures
10. Barriers for the Growth of Competences to Achieve the 2030 Targets
11. Conclusions
12. Literature

The National Energy Independence Strategy provides that by 2030, the share of renewable energy sources in the end use of energy will amount to 45 % (a top ambition in the field of RES development on the EU scale), including 45 % of electricity and 90 % of energy in the central heating sector produced from RES. Moreover, at least 30 % consumers will make electricity to accommodate their own needs. The share of production of local energy in Lithuania will go up from 35 % to 70 %.

The number of employees involved in the construction, design, and maintenance of buildings was 54,904, of which 37,157 are classed as blue-collar workers, and 17,747 as white-collar specialists.

The volume of workforce involved in building construction is expected to grow by 0.6 % annually until 2030. The highest growth rate is forecast for specialists skilled in the application of Building Information Modelling (BIM) methodology (+7.67 % for Lithuanian Qualifications Framework (LTQF) level 6–7 specialists), engineering systems specialists (+5.99 % for LTQF level 6–7 specialists and +2.17 % for LTQF level 2–4 specialists), structural engineers (+3.41 % for LTQF level 6–7 specialists).

To achieve the 2030 targets of sustainable construction, a total of 5,356 persons should be trained every year, including 730 persons at LTQF level 2; 1,046 persons at LTQF level 3; 1,630 persons at LTQF level 4; 1,194 persons at LTQF level 6; and 756 persons at LTQF level 7.

To achieve the 2030 targets of sustainable construction, the aggregate annual number of hours spent developing qualifications must amount to 107,120 academic hours, including 14,600 academic hours for LTQF level 2 employees; 20,920 academic hours for LTQF level 3 employees; 32,600 academic hours for LTQF level 4 employees; 23,880 academic hours for LTQF level 6 employees; and 15,120 academic hours for LTQF level 7 employees, with an emphasis on the competences of the recycling and reuse of materials (circular construction) and the digitalisation of the construction process.

Barriers for the Growth of Competences to Achieve the 2030 Targets

The biggest barriers in trying to achieve the development targets for the sector of sustainable construction have to do with the situation of continuous learning in Lithuania and the breakdown of the participants in the construction sector by age group. The model of personal learning accounts is still under development and is expected to increase the demand for lifelong learning amidst the adults.

As most of the participants in the construction market predict a demand for BIM specialists, it is important to appraise the receptivity of the labour market to the use of specific software. This trait is key both for the competences of BIM and for those of building and parts of building lifecycle analysis (LCA) and the area of digitalisation of the construction process. The expansion of digital competences at small companies with narrow profit margins is impeded by the high costs of computer hardware.

The progress in developing competences is impeded by the public procurement system that is grounded on the lowest bid and, as such, focuses on the price rather than the quality.

The construction sector is still to reach the average EU productivity indicators, and the competitive landscape and employee deficit could become additional obstacles for the companies to send their employees to training.

Engineering studies have been increasingly less popular in Lithuania, which means that the number of persons who are entering the labour market bearing new and relevant competences is also on the decline.

Based on the survey of the participants in the construction market, another less-than-pleasing tendency is that when the market calls for additional competences, companies will be willing to look for trained holders of such competences on the Lithuanian (77.78 %) or foreign (18.18 %) markets rather than train their in-house staff (65.66 %), which, from the employee's stand-point, could be a barrier because employees say that the reasons why they do not pursue training are the high workload on the job (8.4 %), the high cost of the training (5.7 %), or the lack of support from the employer (1.6 %).

Another barrier preventing the monitoring of the progress in developing competences is the absence of a unified database that would allow appraising the development of competences and taking correcting action to achieve the targets in real time.

The potential barriers to achieving the 2030 targets are the sector's relatively low digital literacy and poor lifelong learning indicators. The analysis of national legislation and strategies has shown that there is a lack of systematic incentives for adults to develop general and vocational competences in Lithuania, as the adult lifelong learning system is ineffective and fragmented, lacks financial incentives to participate in competence development activities and does not ensure a diversity of institutions providing services (higher education institutions are excluded).

It is also noted that the above-mentioned reasons prevent the identification of priority areas for competence development, as the lack of easily accessible information on the competences of the sector's workforce does not allow real-time monitoring of the development of competences and the adjustment of actions related to competence development.

Another obstacle to the integration of sustainable construction principles into the market is the declining popularity of engineering studies and the preference of construction market players to recruit ready-made workers rather than to invest in the development of competences of existing workers.

3.3. Comparison among selected countries

Basic identification of selected countries and their construction sector and economic factors are shown in following table.

Table 2. Key economic factors of studied countries

Country	CZ	SK	PL	BG	LT
Inhabitants (mil.)	10,6	5,5	36,8	6,5	2,8
GDP (bln. EUR)	244	97	578	76	60
GDP per capita (thous. EUR/cap.)	23,1	17,7	15,7	11,6	21,3
Construction market size (bln. EUR)	23,2	6,4	n.a.	n.a.	4,3
People employed in construction (thous.)	400	166	464	198	105
People missing in construction (thous.)	80	21	327	49	0

3.3.1. Summary – Czech Republic

The Czech construction industry faces significant challenges, including a shortage of new housing and failure in meeting the national energy efficiency targets. The pace of deep renovations remains low, and the shortage of skilled workers is partially covered by foreign labour. Additionally, the construction industry lacks behind in adopting modern technologies and innovations.

To ensure the competitiveness and sustainability of the Czech construction sector, systematic investment in innovation across the industry is essential. Support for research and development in areas such as robotics, digitalization of construction processes, and 3D printing is crucial. This support can be facilitated through a public funding similar to the THÉTA programme for the energy sector, focusing on the practical implementation of new technologies and methods. The goal is to enhance the industry's competitiveness, efficiency, and technological capabilities, leading to the creation of attractive, modern job opportunities within the sector.

The problem of adaptation of the construction industry in the Czech Republic to new challenges, including the growing demands for energy-efficient constructions, is primarily related to the growth of the qualification of the craft professions but also to the new upcoming professions. In order to address this issue, it will be necessary to increase capacity in primary and vocational training in those fields by 2030. It presents around 20.000 craftspeople in total, particularly:

- Drywaller (excluding wood);
- Carpenter and timber constructions;
- Joiner (including timber construction);
- Completion works bricklayer: thermal insulation, plastering, stucco;
- Low voltage electrician (less than 400V);
- HVAC Technician;
- Plumber of other equipment;

- Siding Installer;
- Solar panels´ and Heat pumps´ installer.

The project team introduced and internally agreed 10 key measures of the Action plan to address these issues. Those measures covered all identified priorities.

Measures of the action plan identified:

1. Development and implementation of a strategy for the sustainability of vocational training in the construction industry;
2. Effective use of existing funds for vocational training;
3. Strategy for Development in Construction Sector;
4. Concept of lifelong learning;
5. Effective Public Procurement;
6. Promotion of research and innovations in the construction sector;
7. Increasing involvement of women in the construction sector;
8. Support for structurally weaker regions;
9. Changing the face of construction industry;
10. Introduction of systematic data collection in the construction industry.

Since October 2023 the discussion of individual measures started. The consortium carried out two public workshops (both in January 2024) with invited stakeholders each focusing on 5 measures of the Action plan. Parallelly, a public consultation through on online surveys was available to collect further feedback.

3.3.2. Summary – Slovakia

The key findings of the Slovak Roadmap reflect experience in chronic labour shortages in key occupations. Although the result for individual occupations or groups of occupations varies considerably, it can be concluded that the shortage of workers in the sector is perceived to be acute challenge. Further, only 9% of graduates from construction vocational schools at secondary level find employment in the construction sector and the rest leave for other sectors. In addition, it should be noted that the demographic trends in Slovakia do not allow for further increases of the number of new pupils. Low ability to retain young people in the sector, especially graduates of vocational schools at the secondary level, is problematic too.

Personal sources have been exhausted and no increase in employment can be expected in the future without qualitative changes in the construction techniques used and the new professions created by them, which will be attractive to young people.

There is a lack of state funding for vocational education schools. This lack of funding is an insurmountable obstacle to the development of education in terms of needs in the horizon of 2035. In one hand goes the lack of teaching and professional staff due to low interest to work in education sector due to insufficient financial remuneration.

The role of continuing education will increase, and it is only logical that the collaboration and symbiosis of formal and continuing education can provide an effective tool to ensure qualified professionals for the construction industry with the required skills, knowledge, and competencies.

Undercapitalized and fragmented building sector composed mostly from Small and medium-sized enterprises (SMEs) and micro enterprises has very limited potential to invest in use of BIM, off-site modular construction or other modern processes and technologies reflecting actual trends.

The Slovak Roadmap adopted 10 recommendations addressed to the Government of the Slovak Republic and to the regional governments that are the founders of vocational education schools at secondary level. The Roadmap shall propose a strategy for the further development of vocational education in secondary schools corresponding to vision for the construction sector for 2035 and 2050. In one hand it shall propose further and continuing education programmes towards microqualifications that will significantly complement formal vocational education in secondary schools, especially in the field of fast-moving innovations. The recommendations are as follows:

1. Update existing and create new fields of study to adapt the fields to technical progress and the needs of the transformation of the construction sector;
2. Support scholarships for pupils in disciplines that are in short supply and needed to cope with the current changes resulting from European and international agreements;
3. State support for the creation of new educational programmes for pupils and adults;
4. State support for the development of new educational programmes for pupils and adults;
5. Providing additional training for teachers on the new skills requirements;
6. Making the teaching profession more attractive and creating the conditions for a significant increase in the interest of young people and professionals in the teaching profession;
7. Review and increase the financing of schools and material and technical provisioning, to create a network of schools with a smaller number of schools, which will be supra-regional and specialised in the construction sector, so that they are provided with the required material and technical provision;
8. Ensuring effectively sufficient data collection on the education system needed for its management, including the employability of graduates;
9. Creation of national campaigns on the employability of education in the construction sector and systematic promotion of the sector by the state in the media;
10. State support of continuing education scheme.

3.3.3. Summary – Poland

The main identified barriers related to the Polish building sector reflect mainly employment and education barriers. Since the analysis of the first project (Build Up Skills I – 2011-2013) the number of workers in the building sector dropped (865 000 – in the year 2010 -> 464 000 – in the year 2022). There is a shortage of skills as well - regarding the basic level of training (vocational schools lack practical subjects, therefore future graduates are not ready to instantly work). There is a serious lack of workers specializing in thermo-modernization and installation of renewable energy sources. A potentially huge and physically efficient workforce – former miners - are not eager to retrain into jobs in the building sector.

Women in the Polish building sector are only 10% of overall employment. Engaging women in the construction sector is essential to cover the shortage of workers as well as improving the quality of some work.

In the questions carried out by the Central Statistical Office in Poland, enterprises point at the shortage of well-qualified workers as the biggest obstacle in their development. There is a lack of cooperation between enterprises and schools, in case of e.g., technology of work or demand for certain jobs.

There are significant problems on demand side as well - only about 25% of building operators and owners see the need to thermo-modernize their building. About 20% never considered or know what is the thermo-modernization.

Conclusion of the draft Roadmap report reflects following aspects

1. Over the last decade, the number of employees in the construction sector has decreased by almost 50%, and there is an observed declining influx of workers with vocational education in this sector. This is a serious problem in the face of the estimated number of buildings that should undergo basic and deep thermo-modernization up to 2050.
2. It is estimated that the necessary number of workers required to implement the renovation strategy is around 327,000 new individuals, in addition to the approximately 464,000 currently present in the market.
3. The curriculum for vocational education in industry-related professions should be revised, considering the very limited information about components related to renewable energy sources and energy efficiency.
4. The number of marketable qualifications in the field of energy efficiency and renewable energy sources included in the Integrated Qualifications System should be increased.
5. Consideration should be given to introducing a mechanism of subsidizing only those investments in energy efficiency and renewable energy sources that are carried out by certified personnel.

6. One large or several smaller campaigns and programs promoting high-quality installation and construction-renovation services, especially thermomodernization, should be conducted.
7. Certification of individuals in the skills of applying the latest technologies in energy-efficient and low- or zero-emission construction should be considered.

3.3.4. Summary – Bulgaria

In Bulgaria, Status Quo Analysis identified several barriers, reflecting vocational education and training system, political and market barriers and construction sector barriers.

The vocational education and training system barriers incorporate non-existent system for continuing professional development, lack of supporting funding for training for companies, lack of practical trainings, a small number of qualified teachers and an unfavourable age structure and insufficient facilities and equipment and lack of funding.

The main political barriers are unstable overall political environment, outdated legislative and regulatory framework, lack of sustainable financial models for low-energy new buildings and renovations and lack of quality assurance and evaluation.

The market barriers relate to the lack of interest in investments in buildings with almost zero energy consumption that are increasing cost of the project, inaccessibility of the market for new technologies, materials and products.

Barriers specific for the construction sector relate to the strong influence of COVID pandemic and other global events, lack of a coordinated labour policy and seeking the qualified workforce, lack of educational culture and motivation. The low prestige of the profession and insufficient salaries in the sector cause low motivation to work in the sector. Sufficient experience and good practices in the construction of highly energy efficient and low emission buildings in missing. The slow adoption of new technologies and effective processes is evident as well.

Based on some unverified data assessment, the construction sector estimated 198 thous. employed persons, as per the official reports prepared by the Bulgarian Construction Chamber. At the same time, according to the forecast of the Ministry of Labor and Social Policies, the number of the construction workers needed in 2030 is about 250 thous., which results in the need to further qualify, re- or upskill 52 thous. specialists and workers.

Indicative goals according to the qualification level are set at 9 thous. personnel with primary and lower education, 40 thous. personnel with secondary education, and 2,6 thous. personnel with higher education.

The Bulgarian Roadmap contains following priority areas with specific measures. For each measure purpose, benefits, responsibilities, resources, implementation steps and timeline have been identified.

1. Priority Area 1. Institutional Framework Strengthening (Objective: Enhance collaboration among government bodies, industry associations, and educational institutions.)
2. Priority Area 2. Policy and Regulatory Support (Objective: Enhance collaboration among government bodies, industry associations, and educational institutions.)
3. Priority Area 3. Educational System Enhancement (Objective: Upgrade educational system features to meet industry needs, fostering lifelong learning)
4. Priority Area 4. Industry Engagement and Collaboration, Technology Integration and Innovation (Objective: Foster collaboration among construction companies, entrepreneurs, and technology providers. Integrate digital technologies, automation, and innovative construction methods.)
5. Priority Area 5. Stakeholders' engagement to improve the public image of the construction sector. (Objective: Improve the public perception of the construction industry and make the construction sector an appealing career choice for youth and women).

3.3.5. Summary – Lithuania

The construction sector in Lithuania does not suffer that much from lacking workforce as the domestic workforce and another eastern countries workers are present in the country. The sector is a vital part of Lithuania's economy, amounting to EUR 4.7 billion and accounting for 7.03 % of the national GDP in 2022. This includes 21.7 % of residential buildings, 37.4 %, non-residential buildings, and 40.9 % of engineering structures.

The Lithuanian construction sector has a tendency for its companies to become smaller, with the number of construction companies increasing by more than 50 % since 2015.

The number of people employed in the Lithuanian construction sector has a general tendency to grow and stood at 104,940 (7.22 % of the total workforce) in 2022, up by 3.2 % from 2021. The total number of identified employees involved with building construction and maintenance is 54,904. On top of that, the number of women working in the construction sector is growing as well and amounted to 16.8 % in 2021. The productivity of the sector is still low and amounts to 69 % of the EU average.

More than one-half of the people working in construction are skilled workers and craftsmen, even though their share has been diminishing for the past few years, with the employers experiencing a deficit of skilled labour. There is no shortage of unskilled workers on the market. 40 % of the people working in Lithuania's construction sector will retire by 2030, besides, there is a threat of specialist deficit for educational establishments are churning out too few skilled specialists.

The Lithuanian construction sector is still among those plagued by illegal labour the most.

Public procurement is still part of a very large portion of the Lithuanian construction sector, with the share of procurement in the construction sector accounting for 3.8 % of the national GDP in 2021.

Lithuania is moving rapidly towards digitalising its construction sector, with resolutions to promote digitalisation (through regulation) adopted at a government level; plus, a lot of things are done at the initiative of non-governmental organisation, even though additional investments are required to help employees retrain, something that the government has no plans for.

Lithuania's circularity index (CI) is still low, and the level of processing and reusing construction and demolition waste in Lithuania stands at 79.5 %, while other countries report a ratio of over 90 %. One of the underlying reasons here is the lack of knowledge and motivation.

With blue-collar professions, the demand and growth predictions for 2030 point to workers skilled in the installation of renewable energy sources, engineering systems, insulation and sealing on buildings, as well as general construction workers.

With white-collar specialists, the demand predictions for 2030 point to construction specialists skilled in the application of BIM methodology, assessment of building sustainability, design of engineering systems and building constructions.

The forecast is that for the Lithuanian market to achieve the 2020 targets for sustainable development in the construction sector, around 107,000 academic hours should be earmarked for the development of employee competences for all LTQF levels every year.

3.4. Comparison conclusion - common aspects of the comparison among the chosen countries

All reviewed countries are facing similar challenges in the construction sector which is adapting to competitiveness and sustainability under the increasing demand for energy-efficient constructions. A common aspect is **lacking** professions, not only qualified but any **workforce in their construction sectors** (with exception in Lithuania where the number of persons employed in construction seems to be sufficient).

- All the countries suffer from both lack of specifically qualified blue and white collars as the need for new professions changes in time.
- Specifically, there are minor differences in lack of concrete professions.

Due to EU directives and common general approach, there are no systemic differences among legislation settings and meaning.

The points below summarise common aspects of reviewed countries:

- Reporting of the chosen countries always reflect the country as a whole. There are no significant differences among regions as central governments have the main role compared to regional ones.
- All the countries have similar share of **women working in the construction sector**. Generally, women represent about one tenth of the overall workforce in the countries.
- All the countries have identified significant gaps in education on all levels including primary, vocational and life-long education. It has been proved by surveys done by all the projects. It is crucial to **enhance the educational system**, including preparation of teaching and training staff for education in accordance with the requirements of modern conduction works and making teaching professions more attractive.
- It is expected continues development of **long-life learning**.
- Better intensive and tailored **cooperation between education and practice** is needed.
- **Funding** must be found.
- Instead of only searching for new personal capacities, higher efficiency of the sector will be needed. Necessity of **investments to new technologies**, automation, robotization, prefabrication is evident.
- Necessity to **motivate people** to start working in the construction sector and keep there for as long time as possible have been identified in all the countries. Motivation shall be **based on clean, lighter work with modern IT and automated tools**. It is necessary to make a fast and significant progress so that the sector is more attractive for a talented workforce.
- The countries mention **green public procurement** and representative role of states as the **accelerator of advanced measures and solutions**.

Some of the aspects mentioned above apply to all countries, others to the majority. As the measures have been approached from different angles in each country, it is difficult to generalize them. Some measures and recommendations are very specific to the country. However, certain aspects have been repeatedly identified in the review. These are presented in the table below.

Table 3. The summary of emphasized aspects by country

Issues/measures	CZ	SK	PL	BG	LT
Lack of qualified workforce	■	■	■	■	
Data collection on the education system	■	■			
Monitoring and forecasting of required needs		■	■	■	■
Enhancement of the educational and training system	■	■	■	■	■
Creation of attractive job opportunities (mostly for students and young professionals)	■	■	■	■	■

Engagement of women in the sector	■		■		■
Use of modern IT and automated tools	■	■	■	■	■
Support to lifelong learning	■	■		■	■
Stronger collaboration between companies and educational institutions			■	■	■
Establishment of the long-term strategy for the development of the sector	■	■			
Increase the prestige and funding for professionals			■	■	
Allocation of funding for vocational education	■	■		■	■
Improve qualification and motivation of teachers		■		■	■
Incentives for retraining employees			■		■
Support to research and innovation	■				
Improve public procurement	■		■		■
Creation of the institutional framework	■	■		■	■

4. Participating in sister project events

With the aim of improving and enhancing the international cooperation and exchange among the member states, the consortium established a BUS cluster of countries involved in National Qualification Platform reboot call. Poland, Bulgaria and Lithuania (PL, BG, LT) have been chosen as sister countries based on a common discussion about relevant parameters discussed in Chapter 3.1.

In May 2023, the project was presented and the overall approach was comparted with other BUS projects during the C4E Forum held in Slovakia, Šamorín. Special session was dedicated to BUS initiative, where BG, HR and RO project was participation. The session included combined presentation with interactive session for the participants (IR cameras, mock ups, games) well evaluated by the audience.

On 11th December 2023, there was the first common online call among DoubleDecker partners and representatives of PL, BG and LT. On the mentioned call, the following representatives took part:

Czech Republic:	Petr Zahradník (CZGBC), Czech Green Building Council and
	Jiří Karásek (SEVEn), The Energy Efficiency Center
Slovakia:	Andrej Slančík (SIEA), Slovenská inovačná a energetická agentúra
Poland:	Piotr Zdanowski (KAPE), Krajowa Agencja Poszanowania Energii S.A.
Bulgaria:	Dragomir Tzanev (EnEffect), Center for Energy Efficiency EnEffect
Lithuania:	Vaidotas Šarka, Lithuanian Builders Association

Additional bilateral calls and written communication followed and served as a base for the following comparison, which contains information from presentations, Status Quo analyses (SQA) and other information received from the sister countries partners.

Beyond the cooperation on the status quo analyses and roadmap preparation, consortia of sister projects established a lasting connection and coordinate actions within BUS. Due the different timeline of selected BUS projects, a deeper comparison of the Roadmaps was limited.

5. Observation and information exchange

Throughout the project, there was maintained regular communication and lively collaboration between Czech and Slovak partners of the project to check the progress of work in their respective country and sharing and comparing it with one another. This ensured that activities in one country were performed with regard to the experience and actions in the other country so that as many synergies are achieved as possible.

This chapter summarises the results of the main BUS Double Decker project´s outcomes and results. It compares the approaches of both – Czech and Slovak project partners and identifies possible replicable good practice lessons. In this respect the project provides a unique opportunity to do this because of i) the language proximity of both countries and ii) the parallel structure of the main project´s outcomes.

The conducted review concerns the following outcomes and topics:

- Status quo analyses;
- Roadmaps;
- Proposed measures;
- New proposed structures of professions in the construction industry.

5.1. General information about Czech and Slovak Status quo analyses

5.1.1. Summary of Czech Status quo analysis

The construction industry has had a long-term significant impact on the state and development of the Czech economy as well as the social environment, including the related environmental and socio-cultural aspects of development.

The pressure to improve the energy performance of buildings (both existing and newly constructed) has a major impact on both the production profile of the Czech construction sector and on the demands for the qualifications of its workers and this impact is going to be even greater in the future. The demand for energy-efficient construction, along with the need to increase labour productivity, demands multiple qualitative improvements in the education sector in the construction sector.

Adult education will play a key role in this. This is due to the following factors:

- Demographic trends, which will result in a slight increase in the number of people of secondary education age (15-19 years) by around 80,000 by 2030, although this number will not reach the peak level of 2010;
- Lack of interest among young people in training for trade occupations in the building sector: the situation is currently slightly improving, but even so, only about 12,000 pupils are being trained in all years of vocational schools (apprenticeships) focused on occupations within the construction sector. The number of graduates therefore barely

covers the number of qualified construction workers retiring each year or moving to other sectors;

- Significant number of construction apprenticeships and secondary vocational school's graduates leave the industry upon graduation to work in another sector. Thus, around 40% of secondary school graduates work outside their field of study within a few years of graduation.

These and other important findings, creating the basis for drafting the Czech Roadmap, originate from the Czech status quo analysis (SQA), where the following topics were thoroughly analyzed:

- National policies and strategies to contribute to the EU´s energy targets in buildings;
- Key data on construction and energy;
- Current situation in the field of education and training;
- Relevant construction skills and projects;
- Skill gaps between the current situation and needs by 2030;
- Barriers.

5.1.2. Summary of Slovak Status quo analysis

The SQA and the work on it is the result of the complex work of the partners and many stakeholders who actively participated in the discussions on the analysis of the data and insights gathered. The main aim of the document was to conduct a thorough mapping of the current situation in the Slovak construction sector and to assess its readiness to fulfil EU´s and national climate end energy targets as well as targets in the construction and renovation of buildings.

To this aim the analysis contains a comprehensive review of the status quo of the following issues:

- National policies and strategies leading to the implementation of the EU´s energy and climate targets for 2030 with a projection to 2050 in the building sector;
- Key data on building and energy sectors;
- Existing provisions in the field of education and training;
- Skills gaps between the current situation and the needs for achieving the 2030 targets;
- Barriers;
- Relevant projects of BUILD UP Skills Initiative implemented in Slovakia since 2011.

After a thorough analysis of these topics, it was concluded that it is necessary to anticipate the critical situation in the building sector in the 2035 horizon and therefore the building sector must undergo the necessary transformation to cope with end-of-life demolition and recycling of a significant part of the current building stock and to provide for new construction based on demographic developments. This transformation will also secure the interest of investors in the building sector and avoid a crisis in the financing of its own business activities, given the shift in investor interest towards financing sustainable business activities, which will also mean that

unsustainable business activities will not have access to financing. For this reason, it is important to pay attention to developments in the EU taxonomy and the adaptation of entrepreneurial activities and its technical indicators.

To do this, it will be necessary to transform vocational education, to promote new approaches, methods and technologies in education and the assessment of learning outcomes, thus anticipating not only the needs of the labour market but also the new social needs that will increasingly be at the centre of attention.

5.1.3. Comparison of Czech and Slovak Status quo analyses

In the chapter of the Czech SQA about National policies and strategies that are aimed to contribute to the EU´s energy targets in buildings, a wide range of policies is analyzed, ranging from implementation of EPBD and RED Directives, through legislation for smart buildings, BIM modelling and digitalization, green procurement up to the education of workforce for the future needs of the building sector.

In this regard, the Slovak SQA focuses primarily on the implementation of the Energy Performance of Buildings Directive (EPBD) and the Renewable Energy Directive (RED) and education policies and strategies. The document contains also detailed information on funding of the construction industry through existing funding mechanisms, involving to a large extent EU funding. This chapter comprises also a review of energy savings in the construction sector in Slovakia resulting from the implementation of Energy Efficiency Action Plans, as well as a review of energy certificates issued in the country.

Another significant difference can be found in chapters analyzing the status quo in education process and vocational education. The Slovak SQA focuses primarily on the general description of legislation requirements or disponible forms of education. In the Czech SQA this topic is being analyzed from the view of education entities entering into process as well as from the view of market situation (evolution of supply and demand for the workforce).

In accordance with the request of the European Climate, Infrastructure and Environment Executive Agency (CINEA) from June 2023, both SQAs were supplemented with summaries of numbers of students in the relevant vocational education fields for the period from the end of the 1st phase of the Build Up Skills Initiative until now, including the projection of the development of the number of students for the coming years.

5.2. General information about Czech and Slovak Roadmaps

5.2.1. Summary of Czech Roadmap

The National Roadmap in the Czech construction industry is a response to the EU's strategic initiative BUILD UP Skills, aiming at increasing the number of qualified workers capable of transforming existing energy-intensive buildings into energy-efficient structures and

constructing new buildings with minimal energy consumption. This roadmap is based on a comprehensive analysis of the current situation and proposes specific measures to enhance the workforce in the Czech construction sector while aligning with European directives.

The Czech construction industry faces significant challenges, including a shortage of new housing and failure to meet the national energy efficiency targets. The pace of deep renovations remains low, and the shortage of skilled workers is partially covered by foreign labour. Additionally, the construction industry lacks behind in adopting modern technologies and innovations.

To ensure the competitiveness and sustainability of the Czech construction sector, systematic investment in innovation across the industry is essential. Support for research and development in areas such as robotics, digitalization of construction processes, and 3D printing is crucial. This support can be facilitated through public funding similar to the THÉTA programme for the energy sector, focusing on the practical implementation of new technologies and methods. The goal is to enhance the industry's competitiveness, efficiency, and technological capabilities, leading to the creation of attractive, modern job opportunities within the sector.

5.2.2. Summary of Slovak Roadmap

The Slovak Roadmap proposes solutions to key findings detected in the Slovak SQA:

- In a survey conducted for the SQA, 100% of firms reported that they experience chronic labour shortages in key occupations. Although the result for individual occupations or groups of occupations varies considerably, it can be concluded that the shortage of workers in the sector is perceived to be an acute challenge.
- According to a recent study commissioned by the government, only 9% of graduates from construction vocational schools at the secondary level find employment in the construction sector and the rest leave for other sectors. In addition, it should be noted that the demographic trends in Slovakia do not allow for further increases in the number of new pupils entering these schools and the number of new pupils has been steadily declining while the average age of the population increased.
- The main problem of the construction sector identified in the SQA is the low ability to retain young people in the sector, especially graduates of vocational schools at the secondary level.

Therefore, the solutions proposed in the Slovak Roadmap reflect the following main conclusions originating from the SQA:

- Extensive sources of employment growth in the construction sector have been exhausted and no increase in employment can be expected in the future without qualitative changes in the construction techniques used and the new professions created by them, which will be attractive to young people.

- The SQA also showed that the biggest obstacle to the introduction of innovative educational concepts is the lack of state funding for vocational education schools. This lack of funding is an insurmountable obstacle to the development of education in terms of needs in the horizon of 2035. It should be stressed that insufficient funding limits the ability of schools to provide even the currently necessary material and technical provisions and to keep pace with current changes.
- The next biggest obstacle related to funding vocational education at the secondary level is the lack of teaching and professional staff due to low interest in working in the education sector due to insufficient financial remuneration.
- The need to meet these, and other external challenges detailed in the Roadmap, is leading to changes in the construction sector towards industrial construction production, much of which will take place off-site (off-site construction). For this reason, many new (new or old in the industry but new to construction) technologies are beginning to make their way into the construction sector and their clusters are enabling further developments in construction techniques.

Based on these results in Slovakia there is expected rather revolution than a slow evolution in the construction sector. The role of continuing education will increase, and it is only logical that the collaboration and symbiosis of formal and continuing education can provide an effective tool to ensure qualified professionals for the construction industry with the required skills, knowledge, and competencies.

The Slovak Roadmap adopted 10 recommendations addressed to the Government of the Slovak Republic and to the regional governments that are the founders of vocational education schools at the secondary level as well as 8 proposed topics to be covered by the new continuing education programmes, updated and new courses of study in vocational education and training at the secondary level.

5.2.3. Comparison of Czech and Slovak Roadmaps

The first part of the Czech Roadmap shortly summarises the main features of the project BUS Double Decker as well as key results of the Czech SQA and their contribution to the development of the Roadmap. Further, based on national targets in the Czech construction sector, the Roadmap defines a matrix of needs and shortcomings of the sector as well as an estimation of the future needs of individual professions in order to be compliant with requested exigences and national targets. The core part of the Roadmap is an action plan consisting of 10 measures. The Action plan contains a detailed description of the measures, including the definition of timelines as well as lead partners responsible for realisation of each measure.

The Slovak Roadmap doesn´t contain a summary of the SQA preparation process but is fully devoted to the planning process itself. The summary at the beginning of the document contains a set of proposed measures clearly depicting the process of realisation of the Roadmap

including proposed timelines and main milestones. The document briefly outlines the general strategy for realisation of 10 proposed measures, including their detailed description, realisation timelines, target groups and responsibilities. The Roadmap also defines additional 8 recommendations to be covered by the new continuing education programmes, updated and new courses of study in vocational education and training at the secondary level.

5.3. Measures proposed in Roadmaps

5.3.1. Measures of Czech Roadmap

No.	Recommendation / Measure	Implementation time frame	Lead partner
1.	Development and implementation of a strategy for the sustainability of vocational training in the construction industry	2025	ČKAIT + SEVEn
2.	Effective use of existing funds for vocational training	2025-2030	SEVEn
3.	Strategy for Development in Construction Sector	2024-2025	ABF
4.	Concept of lifelong learning	2025	ČKAIT
5.	Effective Public Procurement	2024	ČKAIT
6.	Promotion of research and innovations in the construction sector	2025-2030	SEVEn
7.	Increasing involvement of women in the construction sector	2025-2030	ČVUT
8.	Support for structurally weaker regions	2025-2030	CZGBC
9.	Changing the face of construction industry	2025-2030	SEVEn
10.	Introduction of systematic data collection in the construction industry	2024-2026	ABF

5.3.2. Measures of Slovak Roadmap

No.	Recommendation / Measure	Implementation time frame
1.	Update existing and create new fields of study to adapt the fields to technical progress and the needs of the transformation of the construction sector	2024-2026

2.	Support scholarships for pupils in disciplines that are in short supply and needed to cope with the current changes resulting from European and international agreements	2024
3.	State support for the creation of new educational programmes for pupils and adults	2024-2026
4.	State support for the development of new educational programmes for pupils and adults	From 2024
5.	Providing additional training for teachers on the new skills requirements	From 2024
6.	Making the teaching profession more attractive and creating the conditions for a significant increase in the interest of young people and professionals in the teaching profession	2024-2025
7.	Review and increase the financing of schools and material and technical provisioning, to create a network of schools with a smaller number of schools, which will be supra-regional and specialised in the construction sector, so that they are provided with the required material and technical provision	2024-2025
8.	Ensuring effectively sufficient data collection on the education system needed for its management, including the employability of graduates	2024-2026
9.	Creation of national campaignson the employability of education in the construction sector and systematic promotion of the sector by the state in the media	2024-2028
10.	State support of continuing education scheme	From 2024

Proposed topics to be covered by the new continuing education programmes, updated and new courses of study in vocational education and training at secondary level:

No.	**Recommendation / Measure**	**Implementation time frame**
1.	Zero emission buildings, carbon neutrality, and circularity of buildings	2024-2026
2.	Integration of decentralised energy assets and management of flexibility	2026-2028

3.	Integration of XR off and on construction site, and in education	2027-2029
4.	Industrialised construction and Industry 5.0	2029-2031
5.	Adaptation of education curricula to cross-trades	2024-2025
6.	Updating education curricula for vocational education at secondary level to technical progress in digital technologies in construction sector and regenerative cycle of buildings	2026-2029
7.	Updating education curricula for vocational education at secondary level to Industry 5.0 and industrial construction	2029-2031
8.	Launch of the updated curricula for vocational education at secondary level – phase one	2028-2031

5.3.3. Comparison of measures proposed in Czech and Slovak Roadmaps

Based on the proximity of general legislation and the structural environment of both countries, it can be observed that measures react to similar challenges and are facing similar structural problems. However, we can see some differences in both approaches:

Czech measures seem to be oriented to cover selected topics more broadly, targeting to whole construction sector. The description of each measure is complemented with the specification of the project´s partner leading the implementation of the measure, implementation time frame, list of target groups and financial requirements.

Compared to the Slovak approach, measures also cover topics of increasing involvement of women in the construction sector or public procurement. The description of all 10 measures elaborated in more detail, contains more analytical data, which the measures are based on, compared to the Slovak approach.

Slovak measures are intended to be focused directly on topics relating only to education in the construction sector, because this Roadmap being developed within the project BUS Double Decker, is in the Slovak approach perceived as a parallel to the Roadmaps developed in the project Greed Deal for Buildings. The description of each measure is complemented with the specification of the implementation time frame and a list of target groups. Beside of proposed 10 measures, the Slovak Roadmap includes also 8 proposed topics to be covered by the new continuing education programmes, updated and new courses of study in vocational education and training at the secondary level.

5.3.4. New structure of professions in construction industry

New structure of professions in construction industry in Czech Republic

The problem of adaptation of the construction industry in the Czech Republic to new challenges, including the growing demands for energy-efficient constructions, is primarily related to the growth of the qualification of the craft professions but also to the new upcoming professions. In order to address this issue, it will be necessary to increase capacity in primary and vocational training in those fields by 2030:

- Drywaller (excluding wood);
- Carpenter and timber constructions;
- Joiner (including timber construction);
- completion works bricklayer: thermal insulation, plastering, stucco;
- Low voltage electrician (less than 400V);
- HVAC Technician;
- Plumber of other equipment;
- Siding Installer;
- Solar panels´ and Heat pumps´ installer.

It presents around 20.000 craftspeople in total. The existing structure of professions in the construction industry accounts for 23 different professions in total. Detailed overview of the estimated increase / decrease of employees in all the 23 professions, together with an estimate of the requirements for the introduction of innovations, is specified in the Roadmap. According to the Roadmap, it is anticipated, that practically all fields will need to implement content innovations related to work with ICT.

The new structure of professions in the construction industry in the Slovak Republic

New professions at the European Qualifications Framework (EQF) level 3-5 and new roles within existing professions:

- Information Processing Manager/Operator (EQF 4-5);
- Robot Operator (EQF 3-4);
- Digital Collaboration Operator/Specialist (EQF 3-5);
- Cybersecurity Specialist (EQF 5);
- Value Engineering Specialist (EQF 5);
- Smart Building Specialist (EQF 5);
- Artificial Intelligence Application Manager (EQF 5);
- Building installation technician/operator in modular construction (EQF 4-5);
- Construction drone operator (EQF 3-4);
- Planner for smart energy systems with flexibility management (EQF 5);
- Operator/integrator for smart energy systems (EQF 4-5);

- Operator and other occupations in industrial construction production (EQF 3-5).

For example, the new required skills, knowledge, and competences include:

- Cognitive and systems thinking;
- Programming;
- Data-driven decision-making;
- Complex problem solving with excellent communication skills;
- Data analytics, Artificial Intelligence (AI) and BIM;
- Working with robotic resources and drones;
- Modelling and simulation;
- Internet of Things (IoT);
- Computer visualisation;
- 3D printing;
- Prefabricate and module manufacturing in industrial construction
- Integration of energy sources and sectors in smart energy systems;
- Circularity in construction;
- Integration skills, etc.
- Extended reality (XR) including augmented reality (AR), virtual reality (VR) and mixed
- reality (MR);

Professionals with these and other skills, knowledge and competences will enter into practice in two important stages that the Slovak construction industry will have to through and will be important for their evolution:

- The first stage by 2030, when there will be two environments in which they will work - on-site and off-site production;
- The second stage 2030-2035, when integrated industrial construction will have already been formed.

Comparison of proposed structures of professions and identified skills gaps

Although the main identified obstacle - the lack of ICT skills in the structure of professions in the construction industry appears to be the same in both countries, it can be observed, that they choose slightly different approaches how to tackle the issue.

The solutions proposed in the Czech Roadmap are focused primarily on the upskilling or reskilling of existing professions. In addition, the Czech SQA provides a detailed description of the actual need for skills as well as a „projection“ of future needs for all main professions (see chapter 3.3.1.) in the construction industry.

In this regard, the Slovak approach appears to be more radical, as it speaks directly about the need to reflect modern megatrends in construction sector by:

- Creation of a whole set of completely new professions;

- Defining a matrix of new required skills, knowledge, and competences to be incorporated throughout the sector (i.e. in existing and upcoming study programs, as well as in lifelong learning and also in practice).

5.3.5. Identified barriers

Skills and enough skilled construction workers play a key role in achieving 2030 energy targets in both countries. There are several barriers that may prevent the Czech Republic and the Slovak Republic from responding to current changes and maintaining a competitive construction sector.

Barriers identified in the Czech Republic

As a result of public consultations on the SQA complemented with opinions expressed by 60 members of the Czech National qualification platform (covering representatives of large construction companies, craft guilds, business associations, high schools and universities and public administration institutions), a following set of most important barriers was identified:

- Low availability of statistical data on the structure of employment in the construction industry and on the structure of educational capacities of secondary schools;
- Significant share of the building materials industry in achieving environmental goals;
- Absence of a branch research base;
- Absence of a construction education strategy and public support for this education;
- Importance of introducing master exams;
- Low image of work in the construction industry;
- Low volume of housing construction in the Czech Republic;
- Unpreparedness of the Czech construction industry for a massive reconstruction wave;
- Fragmentation of the construction industry (companies, associations, ministry);
- Lack of construction strategy;
- Lack of a strategy for the sustainability of professional education and continuous education;
- External pressures on the construction industry (energy, CO_2, innovation);
- Low attractiveness of the construction industry (working environment, wages);
- Threat of a lack of capacity (manpower, material, demographics);
- High proportion of "micro-enterprises" involved in the implementation of constructions;
- Rigidity (ossification) of the industry (low labour productivity, innovation);
- Public contracts for construction works (improvement of quality, life cycle cost);
- Lack of research focused on the construction industry;
- Lack of system support for education (lifelong learning, teachers, digitization of education);
- Lack of system data collection and their use;

- Underfinancing of the construction industry;
- Lack of connection between secondary education and practice (teaching of experts, news in the field, fair/exhibition);
- Lack of attractiveness in the construction industry (promotion, support for choosing a profession, ...);
- Demography limits quantitative development → qualitative development – the path that sets labor productivity;
- Leaders between schools are formed - use of modern technologies;
- Little desire to introduce innovations;
- Lack of cooperation in the area of common interest (spread of BIM, best practice, ...).

Barriers identified in the Slovak Republic

The European Commission has identified the building sector as key to achieving climate neutrality by 2050. In addition, the Slovak construction sector has a very important position in the Slovak economy. Nevertheless, it is not such a priority of the government that resources adequate to the requirements of this sector and its role in the clean energy transformation are provided to this sector. Based on a questionnaire survey conducted during the preparation of the Slovak SQA among 250 stakeholders of the Slovak National qualification platform, two categories of barriers were identified:

- Barriers on the side of educational institutions;
- Barriers on the side of employers.

Main barriers on the side of educational institutions:

- Funding of vocational schools - not sufficient to provide the required modern technical equipment - an inevitable condition to meet the needs for 2035 targets;
- The lack of teaching and professional staff (due to insufficient remuneration) also has a negative impact on the quality of education and training of students in the construction sector;
- Need to increase the attractiveness of construction occupations in terms of job security or promotion of further vocational training;
- Insufficient cooperation between education and practice.

Main barriers on the side of employers:

- Although the European Commission has identified the building sector as key for the achievement of climate neutrality, the national government doesn´t give enough priority to it;
- The undercapitalized and fragmented building sector composed mostly of SME and micro enterprises has very limited potential to invest in the use of BIM, off-site modular construction or other modern processes and technologies reflecting actual Mega Trends;

- Employers would welcome the existence of a ministry responsible solely for the building sector;
- Shortage of skilled workers (low connection of construction studies with practical training, lack of a link between the education system and the real needs of the labour market, ...).

5.3.6. Comparison of Czech and Slovak Roadmaps from the perspective of identified barriers

Based on the proximity of the project´s partner countries – the Czech Republic and Slovak Republic we can observe some similar structural challenges or difficulties faced by both countries´ construction sectors:

- Shortage of skilled workers, partially covered by foreign labour;
- Shortage of new housing and failure in meeting the national energy efficiency targets.
- Low pace of deep renovations;
- Absence of a central body of state administration responsible solely for the construction industry;
- Need to establish a long-term strategy for the development of the construction industry respecting the involvement of all related sectors;
- Crucial need for fast and significant progress in areas such as robotics, digitalization of construction processes, and 3D printing;
- Need to define new roles for existing professions and specify new qualifications that will be necessary for the successful modernization of the construction industry and translate the new concept successfully into practice;
- Make the construction sector more attractive for a talented workforce through modernization.

6. Conclusions

This report presents the project outputs of selected three sister projects, namely Poland, Bulgaria and Lithuania. The choice of these countries has been made on the base of the assessment of different parameters, such as geographical vicinity, similar historical development or inspiring approach to the Roadmap development. At a later stage, the report dedicates a special chapter on the comparison of results presented in Slovakia and Czechia, which are members of the DoubleDecker consortium. The Czech and Slovak members of the project met regularly to check the progress of work in the respective country and to share good practice lessons. In this respect the project provides a unique opportunity to do this because of i) the language proximity of both countries and ii) the parallel structure of the main project´s outcomes.

The leaders of the consortia also actively participated in EU exchange meetings and participated in sister project events. International exchange activities with the BUS sisters exchanged know-how with other projects running un Build up Skills initiative and enhanced both status quo analysis and the Roadmap creation process and ensured the international communication and information exchange.

A. Deliverable details	
Document Reference #:	D5.1
Title:	Comparative analysis of roadmaps and overview of international activities
Work Package:	WP5
Version Number:	1.01
Preparation Date:	03/2024
Delivery Date:	03/2024
Work Package Leader	CZGBC
Task Leader	T.5.1 Active participation in EU exchange meetings (lead: SVN, national partner: VIA) T.5.2 Peer review activities (lead: SIEA, national partner: CTU) T.5.3 Participating in sister project events (lead: VIA, national partner: SVN) T.5.4 Observation and information exchange (lead: CZGBC, national partner: SIEA, beneficiary: CTU)
Lead Beneficiary	IEA
Author(s):	Andrej Slančík (SIEA), Petr Zahradník (CZGBC), Jiří Karásek (SEVEn)
Contributors:	-
Work Package:	WP5
Type of deliverable:	R — Document, report
Format:	PDF
Dissemination Level:	PU - Public
Key words:	EU Exchange, Status Quo Analysis, Roadmaps, Comparison of common aspects, Synergies.

DoubleDecker project partners: