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Build up Skills (BUS) project in the Czech Republic and Slovakia

Restart of national qualification platforms and action plans to implement nearly zero energy buildings and support a wave of renovations

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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



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Foreword

The construction industry faces challenges like never before. Given that around 80% of existing buildings in the EU will still be in use in 2050 and 75% of buildings in the EU are energy inefficient, their renovation to zero-emission buildings is necessary. Significant challenges are in particular the introduction of innovations, digitalization, integration of renewable energy sources, the high energy consumption of buildings, reduction of greenhouse gas emissions, low labor productivity in the construction sector, high prices of materials, securing the necessary financing for the renovation and construction of buildings from private and public sources and, in last but not least, the lack of qualified labor required to manage these challenges successfully. Since the construction sector has already exhausted the sources of employment growth, its transformation is essential to attract young people to the sector, which will provide them with interesting, motivating and financially attractive work. This requires the cooperation of all actors in the value chain, policy makers, financial and educational institutions.

The DoubleDecker project reflects on these challenges and therefore brought together representatives of all relevant sectors and institutions. Over eighteen months, it brought together a wide range of stakeholders who revitalized the work of the National Qualification Platform (NQP), collaborated on the analysis of the status quo, and subsequently formulated the Roadmap for the years 2025 to 2031, which is presented in this document.

The partners of this project would like to thank the stakeholders who contributed the most to the dialogue within the NQP and expressed their support for the resulting Roadmap. These stakeholders and partners are:

National competent Authorities

Ministry of Industry and Trade of CR

Ministry of the Environment of CR

Ministry for Regional Development of CR

Professional associations

CKLOP - Komora lehkých obvodových plášťů

SIA ČR - Stavitelství, inženýrství architektura

Chance for Buildings

Czech society of civil engineers

National Centre for Construction 4.0 (NCS 4.0)

Czech Premanufactured Building Associations (ADMD)

Association of manufacturers of mineral insulation (AVMI)

Centrum pasivního domu

Association of Building Entrepreneurs of the Czech Republic (SPS)

Czech Chamber of Commerce

Czech Infrastructure Association (ARI)

Construction industry and employers

Metrostav a.s.

JRD s.r.o.

Trigema a.s.

GEOSAN GROUP a.s.

SWIETELSKY AG, s.r.o.

Energie - stavební a báňská a.s.

Energie - nemovitostní a.s.

Knauf insulation s.r.o.

KORE

ReMi Konzult, spol. s r. o.

INOS® Zličín, a.s.

SUBTERRA a.s.

STRABAG a.s.

Syner a.s.

EkoWATT CZ s.r.o

Heimstaden s.r.o

Velux s.r.o.

Pozemní stavitelství Zlín a.s.

Investors and developers

KKCG Real Estate, a.s.

Education, research and academia

University Centre for Energy Efficient Buildings of CTU (UCEEB)

Secondary School of Civil Engineering and Business School, Kadaň

Technical University of Ostrava

Partners of the project

SEVEn, The Energy Efficiency Center z.ú

The Czech Chamber of Chartered Engineers and Technicians Active in Construction

Architecture and Building Foundation

The Czech Green Building Council

Czech Technical University in Prague

1. Summary

Czech construction industry finds itself at a crossroads. The sector is facing fundamental changes in society to which it must adapt. We are tackling a critical shortage of new housing construction while failing to meet national targets in the field of energy savings. The current rate of complex renovations is around 1% per year; however, at least three times this rate would be adequate. Meeting the national Minimum Energy Performance Standard (MEPS) target would mean increasing the rate of complex renovations up to six times.

The interest in the building trades at secondary schools and universities has been steadily declining, with the number of graduates covering only half of the need for workers leaving the construction industry. The long-term shortage of workers is partly compensated by the influx of foreign workers, mostly from Ukraine, who may, however, leave the sector quickly as their country recovers. Labour productivity has been stagnating for a long time, although other sectors are adopting new technologies, going digital and introducing robotics with artificial intelligence at a faster pace. The construction industry is lagging behind in this area.

Innovations to adapt and overcome these barriers are not given sufficient attention. They are perceived as costly and investors lack interest. Yet the construction sector is a key pillar of the economy, essential for achieving energy saving and climate protection targets and accelerating the decarbonization of the economy.

After a thorough discussion, a draft action plan was designed to reflect the identified shortcomings of the Czech construction sector. A list of ten mutually complementary measures was developed:

- Development and implementation of a strategy for the sustainability of vocational training in the construction industry;
- Effective use of existing funds;
- Elaboration of a strategy for the development of the construction sector;
- Concept of lifelong learning;
- Effective Public Procurement;
- Support for research in the construction sector;
- Involving women in the construction sector;
- Support for structurally weaker regions;
- Changing the face of construction;
- Introduction of systematic data collection.

In order to play its role in the economy, the construction industry needs to systematically innovate along the entire value chain. Focusing on innovations that lead to acceleration of new construction and increased renovation rates is essential. The traditional pace of construction (e.g. a single-family house in 2 years) cannot be accepted. Support for research, development and innovation in the areas of robotics, digitalization of construction processes,

3D printing applied to specific construction facilities with the aim of adopting new techniques and in other relevant areas is therefore crucial.

Support for innovation in the construction sector can be implemented through the Technology Agency of the Czech Republic (TAČR), preferably through a public support programme structured similarly to the THÉTA energy support programme. That is to say, the support can be carried out in two streams, namely for research projects initiated by the public sector, in particular by the Ministry of Industry and Trade (MIT), Ministry of the Environment (MoE) and Ministry for Regional Development (MRD), and those initiated by enterprises themselves – in analogy to sub-programmes 1 and 2 of the THÉTA programme. The goal of the programme would be to introduce new technologies and procedures on specific construction sites and to increase the competitiveness, efficiency, technological equipment and the hitherto low productivity of the sector. A positive outcome of the programme would be the creation of modern attractive positions in the construction sector.

2. Introduction

The area of construction, energy and energy-saving construction is divided among several ministries at the level of the Government of the Czech Republic. The Ministry of Industry and Trade is responsible for the building materials, construction, energy, including energy legislation and regulation, and the business environment. The Ministry for Regional Development is in charge of spatial planning and building regulations, housing policy, regional development, European funds and public procurement legislation. The Ministry of the Environment provides environmental policy (including environmental impact assessments), water protection, environmental and ecological damage management, air protection, climate protection, and waste issues. Its subsidy programmes most intensively support energy-saving solutions in civil and residential construction. In this context, the Ministry of Finance is also important, as it prepares draft state budgets and state fund budgets. The Ministry of the Interior then provides a training system for civil servants. The Ministry of Culture takes care of the cultural heritage, the building monuments, that represent a significant share of the built-up area of the historic cores of most Czech towns and cities. The Ministry of Transport and the Ministry of Agriculture manage the construction of transport and water management facilities. The Ministry of Education, Youth and Sports ensures the conditions for pre-school, primary, secondary and vocational education, as well as university education. The traditional education system is administered **separately from the construction industry itself and from the state's programme policies in the field of construction**, which often causes its lagging behind the needs of construction practice. The issue of lifelong learning stands separately, as it is only regulated in the case of engineering and technical professions by Act 360/1992 Coll. on the exercise of the profession of authorized architects and on the exercise of authorized engineers and technicians active in construction, and in the case of certain vocational and craft professions involving fire protection, energy audits, electrical installation work, gas installation, etc. In the case of craft professions, this issue is inconsistently ensured by the voluntary activity of professional guilds or by targeted promotion of some manufacturers of building materials and products for construction.

2.1. The characteristics of the construction sector

The **construction sector** in the Czech Republic has long had a significant impact on the state and development of the Czech economy and the social environment, including the related **environmental** and socio-cultural aspects of development, as it steadily:

- generates about **5 to 6 % of the gross domestic product**;
- employs approximately **7 to 8 % of people working in the civilian sector**. The absolute number of workers in the construction sector is currently (2022) about 400 thousand people. At the same time, the construction industry in the Czech Republic has been

- facing a long-term problem with **labour shortages**, which still continued in 2021 and 2022, both in skilled and unskilled labour;
- shows a significant **multiplier effect** in many areas of the manufacturing sector although this effect has been declining in recent years for the construction sector – the multiplier effect was between **3.2 and 3.5** in 2010, but is now reported at **2.3 and 2.6**, both depending on the type of construction investment;
 - Construction buildings **consume a significant share of raw materials and energy resources**:
 - **Extraction of construction raw materials** and non-metallic raw materials for the production of construction materials accounts for more than **50% of total domestic extraction**, with some sources approaching their limits (aggregates, sand) and the share of imports increasing.
 - **Buildings** are responsible for about **40% of total energy consumption** and about the same percentage of greenhouse gas emissions (mainly CO₂) and solid waste production. This savings potential is addressed by the EED, RES and EPBD Directives, which aim to increase the energy efficiency of the building stock. The EPBD has been incorporated in Act No 406/2000 Coll. on Energy Management, which amends Act No 3/2020 Coll., and in its implementing regulation, Decree 264/2020 Coll. on the energy performance of buildings. The EED a RES directives are also reflected in Act No 406/2000 Coll. and in the Czech Republic's National Energy and Climate Plan;
 - Public procurement has a significant and irreplaceable effect on the development of construction production in domestic procurement. The share in domestic procurement reached **58.8%** in 2021, when the value rose to CZK 131.9 billion;
 - A high level of responsibility is imposed on construction contractors, which also predetermines a high **level of regulation and involvement by the public administration**.

Construction gross value added (GVA) at current prices, i.e. the value newly created over and above input costs (reflecting the sector's capacity strength), has returned to growth in 2021 after a slight decline in 2020, increasing by 5.9% year on year in current prices. Growth – albeit slower – continued in 2022. The share of construction in the GVA of the whole national economy has long been between 5% and 6%, and in 2021 this share was 5.59%. With this value, it practically corresponds to the EU average (27 countries).

However, gross value added in constant 2015 prices in the construction sector continued to decline in 2021, thus significantly lagging behind the 2018 level. The stagnation of performance in 2022 did not change this poor situation. In this respect, the construction sector has confirmed its characteristic of being highly sensitive to the evolution of economic

upturn and socio-political conditions: during the 16 years between 2007 and 2022 (inclusive), 7 years of year-on-year decline, 7 years of growth and 2 years of stagnation have been recorded.

Since the second half of the 1990s, civil engineering has become the strongest construction segment, mainly thanks to state contracts for transport infrastructure. The share of the building construction segment (civil engineering), which is usually the leading segment in Western European economies, was and is still at a lower level in the Czech Republic. The weaker representation of the residential construction segment is particularly striking! The segment of building renovation is also poorly represented.

As to employment, according to the national accounts data, it peaked in 2010, when the construction sector employed the most people (505 thousand). In the following years, employment declined and since 2015, employment in the sector has been fluctuating slightly at around 400,000 people, including the self-employed and entrepreneurs. In 2022, employment slightly decreased compared to the previous year to **403 thousand people**.

2.1.1. Regulations and national policies

Future developments in the construction sector may be considerably influenced by changes in the basic legal instruments affecting the sector. These changes concern in particular the regulations governing spatial planning, construction procedures, public procurement and the expropriation of land or buildings. The standards that set out the basic public interest requirements for building materials and the regulations that take into account the needs of sustainable development of society are also important.

This concerns mainly the adjustment of the following sections:

- Spatial planning and building regulation;
- Environmental protection;
- Public procurement;
- Technical requirements for products;
- Energy performance of buildings.

2.1.2. Education

The introduction of new technologies and approaches will require an increase in the qualification of construction workers (from workers to senior managers). Training processes will thus become one of the major activities of construction companies in the next decade. The system of **continuing adult education** will play a key role in ensuring the improvement of workers' skills.

This is supported by 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 about 80,000 by 2030, but still this number will not reach the 2010 level;
- insufficient interest of young people in training for (craft) occupations in the construction industry: the situation is currently slightly improving, but even so, only about **12,000 pupils** are being trained in all grades of apprenticeship schools focusing on construction jobs. The number of graduates therefore barely covers the number of skilled construction workers retiring each year or moving to other sectors;
- A significant number of graduates of construction apprenticeships and vocational secondary schools with a school-leaving (maturita) certificate go on to work in other fields after graduation. Approximately 40% of secondary school graduates work outside their field of study several years after graduation.

As for adult training in the construction sector (and related professions), it is still very fragmented in the Czech Republic, in terms of content and organization. Content-wise, the implementation of the National Register of Qualifications and the National Register of Occupations promises a methodological unification. However, these systems have not yet proved to be fully effective.

At present, only some 1/3 of all workers in the sector annually participate in any form of education. Moreover, the training is often inconsistent, or touches only partial aspects of the profession.

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

- Drywaller, dry installation (without wood);
- Carpenter and assembler of wooden structures;
- Carpenter (including wooden buildings);
- Bricklayer (completion works): thermal insulation, plastering, stucco;
- Low voltage electrician;
- Air conditioning technician;
- Installation of other equipment;
- Building envelope installer;
- Installer of solar panels and heat pumps.

In nearly all fields, content innovation (working with ICT) will be needed in education by 2030, and they should be particularly strong in the following professions:

- Bricklayer (main construction production);

- Drywaller, dry installation (without wood);
- Plumber-heating engineer;
- Carpenter and assembler of wooden structures;
- Carpenter (including wooden buildings);
- Bricklayer (completion works): thermal insulation, plastering, stucco;
- Air conditioning technician;
- Installer of solar panels and heat pumps.

The total volume of retraining needed in the construction sector in the Czech Republic can be set at about **20,000 trained persons** in the horizon of 2030. As regards the education of university-educated workers for the (green) construction sector, responding to revolutionary technological changes in the sector (digitalization, application of AI, etc.), the problem does not lie in the insufficient capacity of universities, but rather in the obsolescence and low attractiveness of the training programmes implemented there.

As urgent and topical as the issue of saturating the needs of the Czech construction industry in the fields of skilled trades is, equally important, albeit difficult to quantify, is the issue of training university-educated workers for (green) construction sector, responding to revolutionary technological changes in the sector (digitalization, application of AI, etc.).

2.1.3. The amount of construction workforce

At the end of 2022, construction enterprises (section CZ - NACE F Construction, 41-43) accounted for 14.02% (i.e. 351,930 entities) of the total number of registered entities in all sectors. Out of the total number of registered construction enterprises, about 92% were private entrepreneurs (individuals) and 8% were companies. The table below indicates the development of the number of economic entities in the construction sector. As can be seen, these numbers were relatively stable in the long term; a significant increase has occurred only in recent years – it could be the response to the conditions arising in relation to the Covid-19 pandemic.

Table 1: Economic entities according to CZ-NACE predominant activity

Year	2010	2011	2012	2013	2014	2015	2016
Number	322 309	327 356	329 133	310 856	314 707	317 428	320 543
Year	2017	2018	2019	2020	2021	2022	
Number	326 278	330 521	335 443	340 410	345 959	351 930	

The number of business entities in construction in 2021 increased only slightly compared to the previous year and reached a total of 187.5 thousand companies. Traditionally, the largest

number of enterprises falls in the category of the smallest enterprises with up to 19 employees. The same can be said about 2022.

Table 2: Estimated trend in the number of occupations

	Estimated representation of sole traders*	Estimated representation of employees**	Estimation of the distribution			Estimated growth for 2030	
	Coefficients for estimating the number		Trades	Employees	Total	Total	Increase
Coefficient of representation of sole traders / employees	0,568	0,432					
Masonry (bricklayers, stove makers, tilers and drywall installers)	0,331	0,167	75,6	29,0	104,6	108,8	4 %
Insulation	0,028	0,020	6,3	3,4	9,7	10,7	10 %
Chimney sweeping	0,010	0,006	2,3	1,1	3,4	3,4	2 %
Plumbing, heating	0,127	0,057	29,0	9,9	38,9	39,3	1 %
Stove making, air conditioning and refrigeration equipment technicians	0,005	0,019	1,2	3,4	4,6	4,8	5 %
Painting, varnishing	0,094	0,005	21,4	0,8	22,2	22,1	-0,5 %
Roofing, carpentry	0,096	0,022	21,9	3,8	25,8	25,8	0
Project activities in the construction	0,121	0,165	27,6	28,6	56,2	55,1	-2 %
Implementation of constructions, their changes and removal, management staff	0,189	0,149	43,2	25,8	69,0	67,6	-2 %

Building and operating electricians	0,000	0,043	0,0	7,4	7,4	7,6	3 %
Construction foremen and related workers	0,000	0,071	0,0	12,4	12,4	12,3	-0,5 %
Building construction workers	0,000	0,100	0,0	17,3	17,3	16,5	-5 %
Other	0,000	0,177	0,0	30,7	30,7	30,7	0
					402,2	404,7	+ 0,6 %

* Estimation of representation was made on the basis of MIT data – Number of trades according to occupations

** Estimation of representation was made on the basis of IPSV data – Number of employees in the construction industry

IPSV Wage investigation <https://www.ispv.cz/cz/Vysledky-setreni/Archiv.aspx>. Praha 2023

MIT Number of trades <https://www.mpo.cz/cz/podnikani/zivnostenske-podnikani/statisticke-udaje-o-podnikatelich/pocty-zivnosti-dle-oboru-v-jednotlivych-krajich--222296/>

2.2. Barriers to achieving the objectives

On the way to the defined quantitative and qualitative goals of increasing the qualification profile of construction workers, however, a number of **obstacles** must be expected. The most significant ones are:

- Nonexistence of a unified system of construction management, including strategic management;
- Low labour productivity in construction;
- Pressure from companies to use unskilled workers to save labour costs;
- Low level of management;
- Low interest of young people in training in the field;
- Low interest in adult education in skilled trades (low motivation);
- Unpredictability of the legislative environment.

The main barrier to the development of the Czech construction and building industry is the complete **lack of a long-term strategy for the development of the sector**, which would be based on the generally accepted and acknowledged needs of settlement development and the formulation of technical, legislative and investment instruments to achieve such a goal. **The elaboration of a comprehensive long-term strategy for the development of the construction industry with the clarification of the state responsibility for the development**

of education for the construction industry and for the settlement development strategy is the biggest barrier and thus a condition for the effective development of the field.

However, the currently most often mentioned **barrier** (on the part of construction companies) **to construction development is the lack of workers**. Complaints range from the shortage of manual workers, to unprepared replacements for the retiring generation of craftspeople, to a significant decline in students at vocational schools and technical universities/construction colleges over the past decade. High employment, together with the low attractiveness of the industry and especially manual work, resulted in the involvement of a large number of foreign workers. A significant part of these foreign workers come from the Ukraine. The ongoing war in the country highlights the riskiness of this situation. In addition, the system of recruiting foreign workers is facing formal and legislative barriers and is associated with "agency employment" and a black market in workers. The unbalanced sinusoid of the population curve in the past period marked a significant decline in the number of students entering vocational and higher education institutions. With the growth in absolute numbers in the rising generation of secondary school entrants, there seems to be an increase in interest in vocational training in general and hopefully in the construction industry as well since last year. **However, there is a complete lack of systemic support for the study of construction, support for schools and support for students with scholarships and the like.**

The construction industry as a field is characterized globally with a low level of added value, and very slow digitalization of the industry as a whole. Unlike other sectors, the construction process is a very long one (from investment and project preparation, through project approval, subsequent construction and commissioning, it usually takes 5 years or more), in which innovations and new developments are pushed through at different stages separately, but the final implementation according to the "weakest link" principle often presents little progress. The result is always suboptimal, responsive to site conditions, and unique. The new efforts to perceive the construction including the facility management, i.e. also the operation of the building and its lifetime, and even including the cost of its disposal and the return of its materials (recyclability), so far hardly affect the quality and value of the implementation part. Buildings are still assessed mainly in terms of the investment costs of the actual implementation. In an attempt to make the process cheaper (or to maximize profit), most contractors are continuously oriented towards **cheap wage labour, often only unskilled labourers**. The hope, therefore, lies in **finding effective tools to move the construction industry out of the search for minimum costs for the design and construction phases, to focus on lifetime efficiency of buildings, and to stimulate involvement in technical and technological development and progress in the various stages of the preparation, construction and operation of buildings.**

A specific feature of the Czech Republic is the property structure of the construction industry. Large companies are usually part of foreign construction and supply concerns, which often have the nature of an "engineering" organization and sub-contract a large part of their production to smaller specialized companies. These are mostly medium-sized and often specialized companies, acting as subcontractors (plasterers, chimney sweeps, heating engineers, electrical installers, assembly organizations, foundations for buildings, etc.), which focus on the maximum use of a specific technology, installation of specific products and possess specific technical equipment. The largest part, however, consists of sole traders – individuals (accounting for more than 40% of the workforce) who are campaigned on larger contracts as temporary workforce. They provide independently a large share of all reconstruction and renovation works for smaller private builders, or they are "contractors" for their "self-help" buildings. **The orientation towards progress and the conditions for the use of vocational training and lifelong learning are fundamentally different for each of these groups, but this is usually not matched by educational practice or outputs of educational projects.**

Legislative conditions are not favourable to progress and hamper the possibility of enforcement of progressive trends in construction. The most frequently mentioned obstacle is the length of building approvals, where the deadlines of the construction procedure are influenced by many (more than 40) binding opinions based on often uncoordinated and contradictory legislation. These obstacles, together with undignified legal practice, lead to up to ten-year construction approval and permitting periods, during which the original technical concept becomes outdated, the functional specifications often change their content, and this further weakens the ambition for technical progress in the construction industry. The bureaucratic formalism in many opinions and objections often does not address the substance of the projects, but applies an alibi of the approving authorities, which often conceals ignorance, reluctance to innovate, incompetence or, yes, even the complete pointlessness of the opinions given. There is little hope for an improvement in the situation with the new Building Act under discussion due to the increasing number of sections and thus further complications in the approval process.

Another issue is the form of procurement under the Public Procurement Act, which distorts more than half of the market that has to follow it when it comes to public procurement. Individual project stages and deliverables are often procured separately, with a strong emphasis on the lowest prices. A low-cost project may result in a more expensive construction with many changes and additional work. Moreover, a low-cost construction may have a more expensive operation or a shorter lifetime, etc. **Attempts to formally reform most of these regulations only bring specification of legal alibis but do not increase the pressure for greater professionalism, competence and accountability of the various participants, nor for higher quality constructions.** A comprehensive, transparent and credible assessment of

the quality of buildings is what is significantly absent in the Czech Republic, although the ABF Foundation is trying to fill this gap (with the so-called ABF Rating).

The education system has consistently suffered from the remoteness of the demands of practice and the rigidity of classical school and academic practices, which are superior to the need to prepare and train new knowledge and skills for practice. There are a number of issues here, such as how to link school and top practice, the use of the ABF Rating, to select firms from practice as partners of schools for top practice, enabling the participation of leading experts, practitioners, in the educational process, without the barriers of "pedagogical" attestations. Another issue is introduction of Masters craftsmen examinations, and their legalization as a condition for managing a professional firm, strengthening of professional guilds and communities and recognition of vocational Apprenticeship certificates. The ineffectiveness of the work on the NQS and NOS is a worrying issue, as more than 70% of the companies in the department do not use these materials, consider them irrelevant for the assignment of workers, or are not even aware of them. The fact that a large proportion of vocational and university graduates do not enter the construction practice is also bad news. **The task of transforming the education system for the future of digital and robotic construction is the most serious task**, but it is also a way to attract the younger generation to the creative field and to popularize it. The situation requires gradual but substantial changes in apprenticeships, secondary vocational education and higher education, and each system is administered from a different centre (MoEYS, regions, MIT). **Lifelong learning has neither a legislative administration nor a system of financing** and, with the exception of Law 360/1992 (Authorization Law) for CCA and ČKAIT, the requirements for training of officials under the responsibility of the Ministry of Interior and some other regulations (energy inspectors, chimney inspections, electrical inspections, etc.), is left entirely to the private sector without systemic support.

Another barrier is material limits. The construction sector is generally dependent on the domestic material stock, as importing large volumes of material over longer distances adds to overall costs and denies the green Europe trend. At the same time, the production of most domestic materials is relatively energy-intensive (bricks, concrete – or cement, glass, metal structures, ceramics), or does not have sufficiently developed technologies in the Czech Republic (wood processing, plastic for window frames). The long-term prospects for domestic mining of aggregates and sand are not ensured either. The new sources that have been tested only on a pilot basis so far are recyclates, where a way of standardization and homogeneity of the products and the possibilities of their use are being sought. New modern advanced materials are still finding their way to wider application, which is very complicated in the long-term process of building preparation. **The application of new technical devices and IoT elements is confronted with both the length of the construction process and a different understanding of the lifespan and application of high-end products with an often shorter lifetime in the long-term operation of a building.**

Financial resources and economic cycles and how they are projected into the construction sector are areas where the long construction process is also reflected. Therefore, the construction sector always reacts to recovery with a considerable time lag. Ensuring the continuity of public investment is therefore one of the critical issues. Another issue is bank loan financing, which will increasingly apply the European requirements for GreenDeal4Building, i.e. extensive documentation of the green approach. This approach risks putting medium and small companies at a significant disadvantage, as it will be much more difficult for them to document the requirements needed and this will make it more difficult for them to obtain credit financing. **The question is whether the additional bureaucratic conditions will lead to an increase in the quality of buildings or their acceleration or reduction in cost, or only to further growth of consultancy firms preying on the documentary process of construction financing and, as a result, to an overall increase in the cost of construction and stagnation of its productivity.**

The European requirement of the renovation wave is neither methodologically nor organizationally prepared in the Czech Republic. Historic buildings can be divided into several relatively separate structures: the first group are the protected historic cores of municipalities and towns, often enjoying monument protection. This structure is made up of very individual buildings **requiring an individual approach and extensive historical but also traditional craftsmanship skills, and here the question of capacity (human and material) comes to the fore.**

The second group is the built environment (from the second half of the 19th to the first half of the 20th century), which often represents a valuable building structure but requires significant adaptations both in terms of energy, other equipment and individual approach. A separate sub-group is rural development from this period. For this structure, mostly restituted or privatized, **there are no programmes to motivate the renovation.** The implemented forms of renovation are oriented either to above-standard housing or to the change of function to non-residential (office and other) premises, and thus the housing stock and housing function in often central parts of especially larger cities is impoverished.

The third group is housing estates, which represents the largest amount of existing housing stock to date, their lifetime is approaching its limit, and their first phase of renovation (the Panel programme) is practically no longer functioning.

However, we are facing a decision whether (and where) to start the second phase of renovation or, on the contrary, whether (and where) to start demolishing the housing estates. This issue, which is the broadest in terms of volume, is not currently being systematically prepared and studied in a comprehensive way. The question of renovation of buildings from the last era, which meant the development of mainly single-family houses and only complementary apartment buildings construction, raises issues other than renovation (questions of retrofitting new development communities, questions of their transport

accessibility, questions of finding employment opportunities in the place of their construction, or questions of working from home). **The goal for affordable rental housing is completely new.** However, in order to meet this goal, it is necessary to design a very rational construction. This will require a return to typification and the rise of robotization. The aim is cost-effectiveness, the utility value of the new apartments and the complexity of the housing complexes: the new Bauhaus, new requirements for job opportunities close to the residents' homes, a reduction in transport demands, an emphasis on leisure facilities. **There is no strong politically supported effort to promote the aims and ideas outlined in the Architecture and Building Culture Policy, the preparation of modern building design systems for affordable rental housing, but also the spatial preparation of such developments and the philosophy of comprehensive financing.**

It seems that some issues related to building and construction have completely or considerably faded from the attention of the Czech science. The Czech Republic dedicated a record 2% of GDP to science and research in 2021. However, construction and issues related to architecture and municipal development certainly do not receive support corresponding to 6-8% of GDP. The workplaces where construction research is developed are universities and their research institutes (UCEEB or CEITEC). Czech Academy of Sciences does not have a specialized institute dealing with construction, architecture or urban planning. Nor do the MIT and the MRD have any departmental research institutes whose outputs would help find and solve construction issues. This can be seen by comparing it with the situation 30 years ago, when several institutes were involved in the preparation of the concept of construction of housing estates: RIBA, CCBA (ČSVA), USI, Typification Institute, Research Institute of Construction and Earthmoving Machinery (RICEM) and others with a capacity of about 1,000 employees. Private research, conducted by building materials producers but also by software services manufacturers and large contractors, is not separately statistically tracked for the construction sector and is used for protected competitive advantage in the construction market. **The evidence of the lack of a research sector are the activities of a number of non-profit organizations and associations, which mediate the knowledge gained through conferences and trainings for members, or, like SEVEn and the ABF Foundation and others, organize ad hoc teams of external staff for the processing of specific grant tasks and the promotion of the knowledge gained in practice.** A similar endeavour is the efforts of the Czech Chamber of Commerce to introduce a master craftsman's examination, which would enable individual professional guilds to systematize both the issue of Lifelong Learning and to give an unambiguous "brand" to efforts to put pressure on the qualification and expertise, and thus the quality of individual professions.

The Czech Republic does not have a single central administrative institution responsible for construction and building issues. The MIT is responsible for energy policy, the construction of energy networks and resources, the production of building materials and the construction sector in general and for the introduction of BIM. The MRD is in charge of the construction

law and spatial development, public procurement, housing and support from European funds, the MoE has the largest budget available to support energy savings, MoT deals separately with investments and legislation for transport constructions, the MoC has its own competences in the field of protection of cultural heritage, the MoI in the field of education and methodology of local governments, the MoEYS in the field of construction of university campuses and in the field of physical education and youth care, and individual regions implement a number of regional or local investment programmes. Similarly, the issue of vocational education and training of professionals for the construction sector is not managed by one central body. The affordable housing and renovation wave is also an unfortunate example. Its framework is defined by the MRD and the MoLSA but it does not address construction technical issues and investment issues are left to local governments, which are not professionally prepared for such a construction activity. The technical solution of affordable but quality construction is not addressed at all. This is also reflected in the number of flats being built, and not even several dozens of different financial support programmes do provide sufficient incentive. However, investment money is only a small fraction of what the MoLSA spends to support housing costs for socially vulnerable groups. At the same time, these funds do not bring a real improvement in the situation, but only bridge the immediate need of the affected citizens and, as a result, continue to accelerate the inflationary spiral notwithstanding the profits of housing providers. **Repeated attempts to create a single central body responsible for and effective in implementing state investment policy and construction management, or at least a permanent government commission on building and construction to coordinate fragmented activities and fill in the missing elements, have failed to develop over the long term.**

2.3. Methodology for drawing up the plan and securing its approval

This Roadmap document has been produced based on the SQA and the identified barriers to construction development. Its development is directly based on the results of the SQA (draft and the final version) and addresses the gaps and barriers that have been described (see WP2 and section 1.3). The document contains measures to address the defined problems and an action plan. The measures developed include the concept of a one stop shop, which will be elaborated in the Roadmap. The plans will be published as a draft in Czech and Slovak at this stage with an English summary.

During the first phase, a draft Roadmap document was created. The draft document was presented to the broader public in a series of public consultations and discussed at 2 workshops with experts from the construction and education sectors. These consultations produced comments and suggestions which have been incorporated into the plans. In addition to the changes to the plans, the objectives and actions of the plans are assigned to specific stakeholders to ensure that they are met.

The plans are compared with similar efforts in other countries. The international exchange with its BUS affiliated projects (carried out under WP5) will include a comparison with other plans in progress. As a result, the plans will go through a review process that will further improve their quality. The Czech and Slovak partners will then offer the review to the other consortia in the BUS initiative through the EU exchange platform.

An invariable part of the preparation of the plans are the internal workshops, which were organized as half-day hosted working events. The main goal of these meetings was to facilitate the creation of the plans. The workshops used the collective knowledge of the consortium as a key input for the development of the plans, while ensuring that all partners have an overview of the progress of the plans. Where deemed appropriate and practical, other selected collaborators representing the key stakeholders were invited. At least two internal workshops took place in each country (i.e. 2 in the Czech Republic and 2 in Slovakia), one focused on drafting the plan and one on the final form of the plan.

3. The objectives 2030

In compliance with EU targets concerning energy savings and climate policies, less material-intensive and more energy-efficient buildings will also be encouraged. On the one hand, this means maintaining a high share of energy and technical infrastructure buildings in the total volume of construction production, but the scope of maintenance work and changes to completed buildings ("renovation") will also increase significantly, which will create an opportunity especially for smaller companies in the sector. New progressive materials and building elements, supported by the use of modern technologies, will be massively promoted in connection with the change in the structure of demand. There will be a streamlining of construction production and a change in management approaches towards the concept of 'lean construction'. The use of information and communication technologies in the sector will increase.

3.1. Energy targets 2030 – contribution of the building sector

Within the framework of the National Energy and Climate Plan, scenarios have been proposed for setting building renovation milestones by 2050, which are set on the basis of an analysis of the current state of the building stock, building renovation policy and its effect on increasing energy performance of the Czech building stock.

The current development of building stock renovation (BAU scenario) reflects the present situation on the market. The scenario is designed on the basis of data available from the Czech Statistical Office and the Ministry of Industry and Trade. It is a scenario that projects the effect of the state's policy on increasing energy performance of buildings.

The BAU scenario is based on the measures already implemented that contributed to the renovation of the building stock in the period 2014-2020 and the assumption that the set renovation rate and depth of renovation, including other input factors, will continue along the lines of the current trend.

The set values for Renovation Rate, Final Energy Consumption and Renovation Depth are the basis for setting the Real Scenario assuming greater government intervention by 2030 and targeting fiscal and legislative measures to ensure a progress in the Renovation Depth.

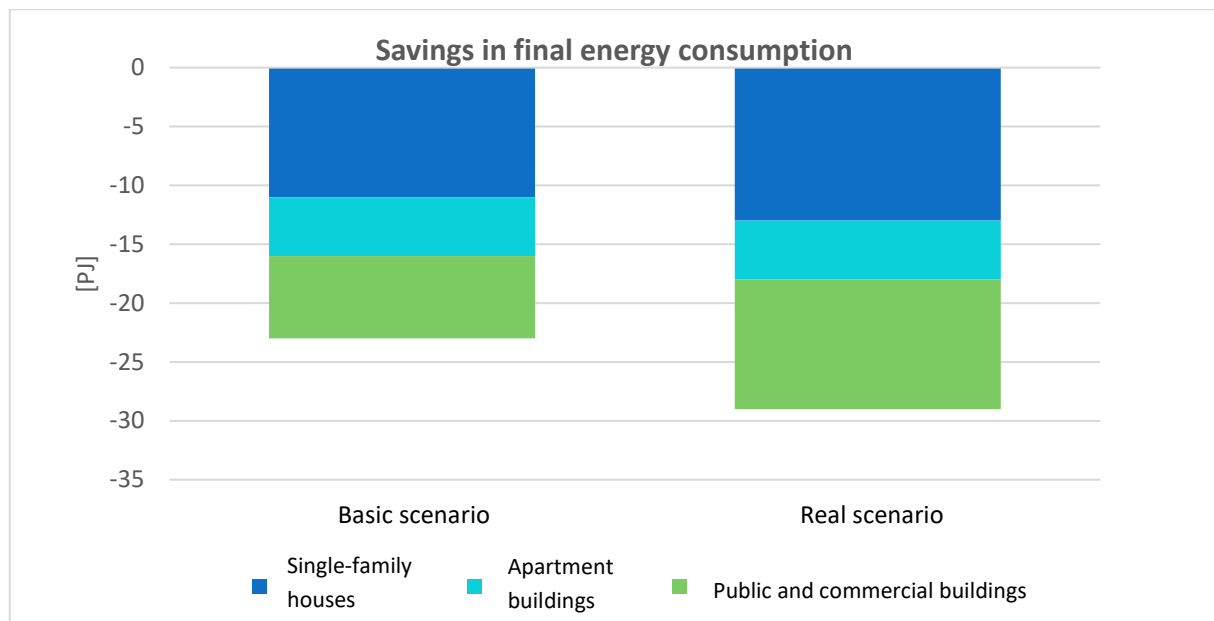
Based on data from the National Energy and Climate Plan, the following developments in the renovation of the building stock up to 2030 can be assumed in a simplified way, which takes into account the contribution of the building sector in achieving the 2030 climate and energy targets (table No. 2).

Table 3: Final energy consumption savings in a given year and cumulative investment costs

For the period 2021-2030	Basic	Real scenario
Savings in final energy consumption over the given period[PJ]	-23	-29
Single-family houses	-11	-13
Apartment buildings	-5	-5
Public and commercial buildings	-7	-11
Cummulative investment costs [CZK billion]	218	262
Single-family houses	113	120
Apartment buildings	30	33
Public and commercial buildings	75	109

Source: MIT for the purposes of the National plan

Figure 1 Savings in final energy consumption for the period 2021-2030 (v PJ)



Source: MIT for the purposes of the National plan

4. Qualification of needs and shortages in the construction industry

The emphasis on the principles of energy-efficient construction will require continuous preparation and implementation of all kinds of innovations in construction companies: technical, technological, organizational and commercial. In this context, extraordinary demands will be imposed on the growth of the quality of management at the level of individual companies, as well as on the growth of the effectiveness of the regulatory environment and conceptual coordination by the public administration.

The evolution of the structure of the construction industry will aim to reduce market fragmentation. The position of large complex companies and medium-sized specialized companies will probably be reinforced. At the same time, the market will be partially "purged", i.e. some financially, staffwise and technologically weaker business entities will disappear. The growth in labour productivity will be accompanied by the reduction in costs, not only in the implementation of the construction works but also in the future operation of the buildings.

In line with EU energy saving and climate policy objectives, less material-intensive and more energy-efficient buildings will also be encouraged. On the one hand, this means maintaining a high share of energy and technical infrastructure buildings in the total volume of construction production, but it will also significantly increase the scope for maintenance work and changes to completed buildings (renovation), which will create opportunities especially for smaller specialized companies in the sector. New progressive materials and building elements, supported by the use of modern technologies, will be massively promoted in connection with the change in the structure of demand. There will be a streamlining of construction production and a change in management approaches towards the concept of 'lean construction'. The use of information and communication technologies in the sector will increase.

4.1. Conceptual basis for the Roadmap

An overall SQA of the Czech construction industry reveals, most importantly, that the sector as a whole is not in the best shape. Its performance, the number of workers and labour productivity are stagnating, and this situation has been going on for so long that some capacity seems irretrievably lost. The pressure to build cheaply ('cheap at all costs'), dictated partly by the market (for private investors) but mostly by public procurement law (for public investors), brings with it pressure to reduce personal costs (especially today, when the costs of materials and energy are rising). As a result, average wages in the sector are relatively lagging behind (from slightly above average 10 years ago to strongly below average today), making the construction sector less attractive, especially for skilled labour. This results in a

situation where there has been a long-term outflow of skilled craft occupations (either to other sectors or to retirement), which cannot be replaced even on balance by graduates of secondary vocational and apprenticeship schools. The attractiveness of the sector, especially for young people and women, is also declining. The labour shortage has thus already become a latent condition that severely limits the demands that construction firms can place on the workforce (including its motivation for further training), even within the "traditional" construction industry.

The Czech construction industry has so far been able to respond only marginally to the challenges posed by the demands for energy-efficient construction and the demands for revolutionary process changes in construction (such as digitalization and the application of AI). Equally "conserved" is the shape of the education system, which is unable to provide the education of workers corresponding to the technical and technological demands of modern construction 4.0.

The implementation of the international commitments (within the EU), which the Czech Republic has accepted in the field of sustainable construction and renovation, cannot be left to the internal forces of the construction industry alone; a strong state intervention will be needed. In recent years, new requirements for the form, quality and sustainability of construction have begun to be applied in the Czech construction industry. New requirements have been formulated for architecture and building culture, for energy efficiency, for carbon-free economy, for waste management and for the recyclability of the materials used. A phenomenon of the times is the emerging digitalization and Construction 4.0. In this context, the European Union has announced a "renovation wave" which should increase the level of construction effort in renovating existing buildings and adapting them to new requirements 2-3 times. This entails new strategic changes over the next five years, but also beyond 2030 until 2050.

New questions are set. Many decisions will require reconsidering the issue of resources, not only in terms of energy, but also in terms of materials and human resources. The construction industry has always been local, linked to local resources: bricks, stone, wood, glass, cement and their transport. The sector has always employed a significant proportion of less skilled workers, but is currently facing a growing shortage of craftsmen and manual workers in general. How will this situation be affected by the advent of artificial intelligence (AI) and robotics, particularly in the "renovation wave"? The answers to these questions are not only technical, but increasingly social and economic. In this context, two national strategic objectives can be formulated:

1. **Use of BIM model for the entire life cycle of a building** for data transfer between partners, for distant cooperation, for streamlining, shortening and improving the entire construction process and construction care. However, this goal will also bring about an increase in the laboriousness of processing some project phases, the need for updates of

data from the construction and building operation process and finding common data standards for all participants, which is a condition for their voluntary participation in the BIM system. This may require considerably varying levels of responsiveness among the participants and the need for a new redistribution of tasks and responsibilities between partners. If Construction 4.0 is to be a revolution in the construction process, it must make a significant social and economic contribution, not without the loss of many professions, the creation of new professions, the setting up of new roles and the redistribution of responsibilities between them.

2. **Establishment of a digital model of the built environment**, which will gradually include digital information about the entire area (cadastral data, a digital technical map, landscape and geological conditions, social and economic data, data on traffic loads, air flow, and current data on the state and operation of the area; it will also include spatial analytical documents, digital spatial planning documents, and various discussed land use and investor plans). Gradually, this model will be filled with BIM models of individual buildings, either from upcoming and new buildings, or as a result of the digitalization of existing buildings for the purposes of facility management and the upcoming renovation wave. It can be expected that implementation of this model and its dynamic use by all partners of the construction is a task which will not be accomplished during the first stage until 2030. However, its establishment and perhaps also its legal anchoring in the forthcoming BIM Act should create a framework for its gradual formation. The path towards this model will probably be affected several times by new technical possibilities but also requirements for specific use of already processed data sets.

The current crossroads at which the Czech construction industry finds itself, significantly complicates the possibility of **accurately estimating the** requirements for the construction workforce, both in terms of numbers and qualification structure. The reality is that the continuous shortage of workforce in the Czech construction industry, due to the low attractiveness of this sector (in terms of remuneration and working environment) in competition with other sectors, can only be solved by digitalization of the construction industry, or the introduction of other modern technical and technological changes in the process of preparation, construction and management of buildings and networks. This modernization, closely related to the requirement for energy efficient construction, therefore places entirely new demands on the number and qualification of workforce, and therefore on their training. However, it is difficult to articulate (and quantify) these requirements, as they are still rather theoretically suspected and are currently mentioned only marginally by construction companies, but also by investors. The "pressure from below" is thus mainly reflected in the demand for **traditional construction professions**. This call "from below" has a rational core. Indeed, in the Czech context, there has been a long-term shortage of craft professions, ageing of their bearers and a slow "influx" of new workers from primary education institutions. The solution may be to increase the proportion of retrained workers,

including those entering craft roles with growing technical progress, using sophisticated technologies and increasingly challenging equipment.

Construction in the Czech Republic will not be able to do without additional sources of craft professions by 2030. Ensuring sufficient numbers of craftspeople has a strategic dimension: the requirements for an increased rate of renovation of the existing housing stock (including listed buildings), together with the requirements for increased energy efficiency of renovated buildings, will continue to place great demands on quality craftsmanship in the future, and thus on the number and especially the quality (or appropriate structure) of craftspeople in the construction industry.

4.2. Estimates of the requirements for individual professions and the way to train them

As for the the overall extent of employment in the construction sector in 2030, it will certainly not undergo any major changes compared to today. This is evidenced both by demographic development with its insignificant effects on the extent of labour supply in the labour market in general, and by the considerable rigidity in the development of social and economic factors affecting the attractiveness of work in the construction sector. Therefore, even in a relatively optimistic scenario, **an increase of only 0,6 %** can be expected between 2023 and 2030!

At the same time, in this optimistic scenario, some **quantitative shifts within the structure of total employment** can be expected, especially to improve the ratio between "executive" and "staff" workers. The number of people involved in one way or another in the management of construction production currently stands at 154,7 thousand, while for 2030 it can be estimated at 152,5 thousand, i.e. by 2,2 thousand less (- 1,5 %). In contrast, the category of construction workers could and should grow from 186,7 thousand by 3,8 thousand (+ 2,1 %) to a total of 190,5 thousand. In the "assemblers" category, the boost should be even more noticeable, from 30.6 thousand to 31.8 thousand (+ 1.2 thousand, i.e. + 4.0%).

Realistically, therefore, we can expect a **maximum of 5,000 more people in craft occupations by 2030**. It is obvious that such a small change would be completely inadequate to the newly emerging demands for energy-efficient and technologically modernized construction in the Czech Republic. The solution can only lie in shifts between occupations, i.e. that employment will fall in some craft occupations in order to grow in others. An overall overview is given below:

Table 4: Quantitative requirements for individual crafts and the level of innovation in their training by 2030

Crafts	Expected growth or	Innovation rate of knowledge and
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		decline by 2030	skills of professions by 2030
MBP			
1	MBP Bricklayer	slight decline	system innovations
2	Erector of concrete and steel structures	slight decline	partial innovations
3	Concrete and iron work	slight decline	partial innovations
4	Plasterers, dry installation (without wood)	slight increase	system innovations
5	Machinist, machine operator, crane operator, scaffolder, driver	stable number	
ACP (Auxiliary construction production)			
6	Insulation worker, waterproofing, roof insulation	stable number	partial innovations
7	Plumber, water, sewerage, gas	stable number	system innovations
8	Plumber-heating engineer	decline	system innovations
9	Stove maker and chimney sweep	decline	system innovations
10	Carpenter and assembler of wooden structures	slight increase	system innovations
11	Roofer	decline	partial innovations
12	Tinsmith	stable number	partial innovations
13	Construction joiner	slight increase	system innovations
14	Locksmith	stable number	partial innovations
15	Flooring installer	stable number	partial innovations

16	Painter, varnisher, paperhanger	stable number	partial innovations
17	ACP/PSV Bricklayer: thermal insulation, plastering, stucco, tile setters, stonemasons:	slight increase	system innovations
Mcen			
18	High-voltage electrician	stable number	partial innovations
19	Low-voltage electrician	huge increase	partial innovations
20	Air conditioning technician	huge increase	system innovations
21	Installer of other equipment	slight increase	
22	Building envelope installer	huge increase	partial innovations
23	Solar panel and heat pump installer	huge increase	system innovations

In order to manage this educational manoeuvre, however, it will be necessary to fulfil an essential information requirement, i.e. to **renew statistical monitoring of the detailed structure of employment** in the Czech construction industry and a similarly **detailed structure of the number of students in individual construction specializations at secondary schools**.

5. General strategy

5.1. Establishment of the National Qualifications Platform

SEVEn, with the contribution of other partners, established a National Qualification Platform (NQP). The NQP serves as a base for other tasks and events related to multiplier collaboration. The NQP has approximately 15 permanent Czech members and several temporary members who will be co-opted for specific tasks or sub-tasks, and 39 Slovak members. NQP members include various experts, organizations, associations, universities, schools, etc. The NQP has its own national leaders for the Czech and Slovak part. The NQP is led by SEVEn.

5.2. Communication and opinion gathering

Gathering the views of all stakeholders and ensuring the necessary consultation with financial institutional bodies and market operators is essential to achieve the project objectives and to identify gaps in the construction sector.

There are 4 groups of public stakeholders: government authorities and regional representatives (Ministry of Regional Development, Ministry of Industry and Trade, Ministry of the Environment, State Environmental Fund, regional authorities), education representatives (representatives of affected schools and teachers), the construction industry (representatives of companies, project developers, professional associations, experts for specific areas, ESCO, manufacturers) and other relevant stakeholders (financial institutions, lawyers).

5.3. Status Quo Analysis (SQA)

The SQA at the national level was prepared in the respective national language (Czech and Slovak) and then translated into English. All versions in these languages are publicly available. The final SQA provided both project countries with an updated comprehensive overview of the current legal framework, with an emphasis on the challenges related to the acquisition of the necessary skills and qualifications in the construction sector. The analysis provides an understanding of the principles of the current education and training system in the national construction industry, an overview of national vocational training institutions providing the necessary continuing education and professional upgrading, as well as their flexibility to meet the new requirements arising from the 2050 European Green Deal targets and the revised EU 2030 target of 40% renewables. It identifies future needs and gaps in training, retraining and upskilling in the construction sector by 2030, based on new multifaceted challenges and national market demands.

5.4. Workshops

To ensure effective stakeholder participation, NQS members were invited to the so-called “2+2 workshops”. These workshops were organized by the NQS leaders. A total of four “2+2 workshops” were held in each country. Two workshops were dedicated to the SQA under WP2 (M7-M9) work package and two workshops focused on the process of plan development (M16-M18) within WP4. The workshops were adapted to the needs of the tasks under WP2 and WP4. The WP4 (plan) workshops enabled the transfer of know-how, identification of the most important steps and Exchange of knowledge for the upcoming national plan. At least 25 representatives were invited to the workshop. The leaders of the National Qualification System ensured that all relevant expertise among the invited workshop participants was in line with the state of the art report.

5.5. Approval and support of action plans

The aim of endorsing plans is to get the key stakeholders in each country to endorse the action plan and proposed actions, and to secure their commitment to contribute to or implement the proposed actions. The endorsement uses a public consultation process to present the final action plans, disseminate them among as many stakeholders as possible and gain as much support for the plans as possible.

The feedback gathered is incorporated back into the plans where necessary to ensure wide acceptance of the document among stakeholders. Two final conferences (1+1, one in each country) were held in the period from M17 to present the plans and confirm support from key stakeholders and to launch other sustainable NQS activities beyond this project.

6. Identification

Identification of the gaps and needs of the construction sector was carried out in the following ways:

- **Public consultations, questionnaire survey** – Both parts of the project, i.e. the SQA and the development of the plan documentation, were subject to public consultation with several important stakeholders who are not part of the National Qualification System. The total number of consultations was 50 per country (100 in total). The consultations were conducted separately for the SQA and the plan development process. Most public consultations were conducted bilaterally, while a few stakeholders were consulted multilaterally. A semi-structured interview method was used for the consultations, which allowed for both the opinion and data collection.
- **Data analysis**
- The **consortium's knowledge and experience** of the issues from their fields and related to the Czech construction industry.
- **Workshops** – Two workshops were ensured with external participants, where the SQA results were presented and a wide public expert discussion was initiated.
 - workshop focused on schools and education
 - workshop focused on the industry

6.1. Inspiration from the SQA public consultations

During the summer of 2023, public consultations were organized over the final form of the SQA. Over 60 stakeholders from large construction companies, craft guilds, business associations, secondary and higher education institutions as well as public authorities were involved in these consultations. On the whole, these consultations confirmed the high standard of the elaboration of the SQA and mostly only highlighted some of the aspects addressed in the SQA. Among the most important and also the most frequently mentioned ones were the following:

- Low availability of statistical data on the structure of employment in the construction sector and on the structure of educational capacities of secondary schools;
- Significant contribution of the building materials industry to the achievement of environmental objectives;
- Absence of a sectoral research base;
- Lack of a strategy for construction education and public support for construction education;
- The importance of introducing the Master craftsman examinations;
- 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 renovation wave.

These inspirations were also used in the selection of Roadmap measures, crucial for the adaptation of the Czech construction sector to energy-efficient construction and to technical and technological modernization.

6.2. Identification of shortcomings in the construction industry - internal workshop

The project included an internal workshop of the project partners / consortium. An international discussion was opened between Czech and Slovak partners who exchanged their views and experience on construction issues in both countries.

The following shortcomings were identified:

- Fragmentation of the construction sector (companies, OSS, ministry);
- Lack of a construction sector strategy;
- Lack of a strategy for sustainability of vocational training and continuing education;
- External pressures on the construction sector (energy, CO₂, innovation);
- Low attractiveness of the construction industry (work environment, wages);
- Capacity shortages (workforce, materials, demographics) are imminent;
- High proportion of "micro-enterprises" involved in the construction;
- Rigidity (ossification) of the sector (low labour productivity, innovation);
- Public procurement of construction works (quality improvement, LCC);
- Lack of research focused on the construction industry;
- Lack of systemic support for education (MTB, LLL, teachers, digitalization of education);
- Lack of systemic data collection and use;
- Underfunding of the construction sector;
- Lack of linkage between secondary education and practice (teaching of experts, new developments in the field, trade fair/exhibition);
- Lack of attractiveness of the construction sector (promotion, support for career choices, ...);
- Demography limits quantitative development → qualitative development – a path that sets labour productivity;
- Leaders are being formed among schools – using modern technologies;
- Low enthusiasm for innovation;
- Lack of collaboration in areas of common interest (dissemination of BIM, best practice,...).

7. Action plan

The Action Plan is a key tool for putting the National Plan into practice. The main content is the specific measures of the Action Plan, which have been developed as a logical link between the long-term priorities of the National Plan, the current requirements of the European directives, the legislation in the Czech Republic and the (expected) capacities in terms of financial and human resources.

7.1. Action plan measures

The selection of specific measures within the Action Plan was made after a thorough discussion in the team working on their implementation. These measures can be divided according to their nature into non-investment and investment measures, as well as education and systemic (support) measures. Each measure in the Action Plan is described by a unified structure that includes its purpose, objectives, promoters, partners, implementation dates, costs and financing methods. While these measures broadly reflect the structure of the National Plan measures, the Action Plan is designed to concentrate usually several objectives of the National Plan in each measure at the same time.

Table 5: Draft Action plan measures

No.	Name of the measure	Lead partner
1	Development and implementation of a strategy for the sustainability of vocational training in the construction sector	ČKAIT + SEVEn
2	Efficient use of existing funds	SEVEn
3	Preparation of a strategy for development of the construction sector	ABF
4	Concept of Lifelong Learning	ČKAIT
5	Effective Public Procurement	ČKAIT
6	Support for research in the construction sector	SEVEn
7	Involving women in the construction sector	CTU
8	Support for structurally weaker regions	CZGBC
9	Changing the face of the construction sector	SEVEn
10	Introducing systematic data collection in education	ABF

Measure No. 1

Development and implementation of a strategy for the sustainability of vocational training in the construction sector

Content of the measure (brief description of the problem):

The problem of adaptation of the Czech construction industry to new challenges, including the growing demands for energy-efficient construction, is primarily related to the growth of qualifications of craft and specialized professions. Virtually all disciplines will need to implement content innovations in education by 2030.

The development and implementation of a strategy for the sustainability of vocational training in the construction industry is a key step towards the future of the sector. This strategy should be designed to take into account current challenges such as environmental sustainability, technological progress and social responsibility. The first step is a thorough analysis of the current state of vocational training in the construction industry, including an assessment of existing programmes, methodologies and needs of the sector; this essential step has already been elaborated in the SQA of the current state of the construction industry. Based on these findings, it is possible to develop a strategy that emphasises innovation in teaching, the incorporation of modern technology and an increased emphasis on green and sustainable practices.

Implementation of this strategy requires cooperation between educational institutions, industry partners and government organizations. The key elements entail development of new educational modules and courses which reflect the most up to date technological trends, and support for teachers and lecturers in acquiring skills for teaching modern methods and technologies. Emphasis should also be placed on creating a stimulating and inclusive learning environment that encourages teamwork, creativity and innovative thinking.

The strategy for the sustainability of vocational training in the construction industry should be continuously updated and adjusted according to industry and society development. This can ensure that future generations of construction workers are prepared for the challenges of the 21st century and that the sector itself plays an active role in the sustainable and innovative development of our society.

Implementation of the vocational training strategy is a complex process that requires collaboration and involvement of various stakeholders. Government bodies have a crucial role in developing policies and regulations on education. It is important to ensure that sustainability is integrated into school curricula and education policies. Schools and universities are key players in the implementation of sustainable education and will be involved in the process to adapt their curricula and teaching methods.

Purpose of the measure:

The purpose of developing and implementing a strategy for the sustainability of vocational training in the construction industry is a multifaceted and essential tool for the industry, workers and society as a whole:

- The introduction of sustainable elements into education programmes improves the overall quality of education in the construction sector. Students gain knowledge and skills that are in line with modern standards and new technological trends, improving their chances of a successful career.
- Quality and sustainable education increases the prestige of the sector. Employers, clients and the public tend to have more respect for professionals who are well trained in current sustainable practices.
- Vocational training that responds positively to environmental and social challenges contributes to the social responsibility of educational institutions and the construction sector.

The formulation and implementation of a strategy for the sustainability of vocational training in the construction industry lies in the preparation of a workforce that not only meets the current needs of the industry, but is also prepared for future challenges and contributes to the sustainable development of the construction sector.

Objectives of the measure

Analysis of the current situation: The first step involves a thorough analysis of the current state of education in the construction sector. This includes assessment of existing education programmes, a survey of industry needs, identifying key skills and knowledge that need to be developed.

Definition of sustainable goals: It is necessary to define objectives and priorities for the sustainability of vocational training based on the analysis. This may include a focus on environmental sustainability, occupational safety, innovation and other key areas.

Development of new education programmes

Involving industry partners: Involvement of industry partners is key for successful implementation. Collaboration with construction companies, architectural studios and other actors in the sector allows us to take into account the real needs of practice and ensure that training programmes correspond to current trends.

Training of teachers: teachers and lecturers must be trained in modern teaching methods, technologies and topics related to sustainability in construction. Their professional qualifications must be continuously updated.

Practical applications and projects: Implementation of a strategy should involve practical applications and real projects which will enable students and workers to gain experience in sustainable practices directly on construction sites and in working environments. The number of hours of compulsory practical experience must be

increased.

Monitoring and evaluation: an important step is to continuously monitor and evaluate the effectiveness of new training programmes. This will allow to identify strengths and areas for improvement so that the training process can be continuously enhanced. Students and staff should be involved in the evaluation process and provide feedback. Their opinions and experience can provide valuable information for further improvements of educational programmes.

Sustainable development: Implemented programmes should be designed to be sustainable in the long term. This means that they need to be flexible, responsive to the changing needs of the sector and society, and have built-in mechanisms for ongoing updates.

Target group:

Secondary schools, regions
 universities, MoEYS

Optimal date of implementation:

2025

Method of funding: ESF, MIT

Type of measure: Non-investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

CZK 5 mil. – strategy development, CZK 10 mil. /year – implementation

Guarantor/measure sponsor for the BUILD UP Skills project:

ČKAIT + SEVEn

Partners of the measure:

(TBA)

Measure No. 2

Efficient use of existing funds

Content of the measure (brief description of the problem):

The aim of the measure is to strengthen the transfer to attractive areas of the construction sector with high remuneration demand and added value, to contribute to a more efficient use of funds for the training of construction workers and to help with the recruitment of new workers from other sectors. The efficient use of funds in the construction sector will contribute to a multiplier effect and encourage economic growth.

First of all, it is necessary to reallocate funds in the Operational Programme Employment Plus (OPE+) which is a key instrument for the use of funds from the European Social Fund Plus in the field of employment and social inclusion in the programming period 2021-2027. The total allocation of OPE+ is approximately CZK 49 billion and almost half of this allocation will be given to the support of employment, adaptability of the workforce and gender equality, while over 40% of the total allocation will be assigned to activities devoted to social inclusion, financing of social services and material assistance to the poorest.

However, other operational programs in the 2021-2017 program period that can support the increase of workers in the construction industry should not be forgotten either. For example, the Integrated Regional Operational Program to support territorial development, improve infrastructure, improve public services and public administration, and ensure sustainable development in municipalities, cities and regions. This also includes support for educational infrastructure at primary, secondary and vocational schools or support for polytechnic education. The Jan Amos Komenský operational program, which aims to support the quality and accessibility of education at all levels, starting with pre-school education and ending with the areas of research and development, and includes, among other things, support for the development of lifelong learning.

The Operational Program Technology and Applications for Competitiveness is used to co-finance business projects in the field of research, development and innovation, digitization and digital infrastructure, business development, smart and sustainable energy and the circular economy. The modern and innovative environment in businesses is attractive to the younger generation. The Just Transformation operational program supports the improvement of living and working conditions for workers leaving the coal industry. Last but not least, the Operational Program Technical Assistance is very important, which is primarily intended to ensure the effective use of funds from operational programs (promotional administration, actor support).

Purpose of the measure:

The purpose of the measure is to reinforce the position of the construction sector so that more workers come into the sector, the number of skilled workers increases and

sufficient access is provided to new workers from other sectors.

Improving knowledge and awareness of national and European funds that can be used to train construction workers. Facilitate the use of funds for construction firms to improve the skills and knowledge of their workers.

Objectives of the measure:

Education and Information:

- Providing appropriate training and education for people interested in entering the construction sector.
- Raising awareness of the various career opportunities in the construction sector can attract people who are unaware of the wide range of career options the sector offers.
- Provide businesses with clear and accessible information on available grants, application processes and conditions for benefiting from funding. Organizing workshops and seminars to help them understand the procedures and rules.

Consulting Support:

- Provide expert consulting support to businesses in the preparation of grant applications for projects they wish to implement. Experts can help with project design and documentation. Obtain feedback from businesses that benefit from subsidies. Learn from mistakes and experiences gained from previous projects and adjust procedures when needed.

Target group:

Non-construction workers
 Construction workers
 Workers in education
 Construction companies

Optimal date of implementation:

2025 to 2030

Method of funding:

OPE+, MoLSA, MoEYS and MoRD

Type of measure:

Financial

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

100,000 per year by reallocating existing resources

Guarantor/measure sponsor for the BUILD UP Skills project:

SEVEn

Partners of the measure:

(TBA)

Measure No. 3

Preparation of a strategy for development of the construction sector

Content of the measure (brief description of the problem):

Strategy of the construction sector

The Czech Republic does not have any officially developed construction strategy that would be the result of a systematic effort and that would be systematically discussed and adopted both by official institutions and the main stakeholders in the field.

The principal starting point for the preparation of the strategy is the Status Quo Analysis of the Czech Republic, a document that characterizes known and recognizable trends and influences in the Czech Republic. The particular SQA will, however, need to be supplemented by other surveys concerning:

- Housing and urban planning;
- Digitalization of the construction sector;
- Infrastructure deficits;
- The state of the resource base;
- Deficits in research capacities.

At the same time, the strategy will have to find a response to the current crisis trends in employment, i.e.:

- The shortage of workers and dependence on foreign workforce (20% are foreign workers in the industry, even 40% in Prague).
- Significant decline in the number of professionals and the number of workers in the upcoming generation.
 - Decline in the number of apprentices, and graduates are not entering the field (about 30% are joining the field);
 - Decline in the number of secondary school technicians;
 - Decline in the number of engineering graduates by up to 50% in some fields.

And also to critically evaluate the instruments of regulation and support of the construction industry and their effectiveness, e.g.

- Integrating all processes in construction and making them more efficient by interlinking them:
 - Project and investor preparation
 - Legislative conditions "for constructing"
 - Production for specific buildings (typification, standardization, Construction 4.0)
 - Building for long-term use (not quick sale) across a functionally interconnected portfolio;
- Digitalization of the design, administration, preparation and management of buildings, digitalization of their operation management;
- Robotization of the production of AI-assisted construction products for a

- specific building and for a specific project;
- Robotization of the construction process: 3D printing, bricklaying and assembly robots, prefabrication and standardization of products;
 - Streamlining the entire construction and supply process with the use of AI and construction productivity to reduce the cost of construction;
 - Total change of the legislative environment and legal responsibility for the entire construction process: spatial planning focusing on regulation plans, gradually introducing a dynamic digital plan for the entire territory, unifying all forms of planning, regulation and information on the state of the territory into a single open information model;
 - Emphasis on training and adoption of the necessary changes, including the new concept of Lifelong Learning, development of the Czech Academy of Construction project;
 - Maximum use of quality assessment for passing on experience from good practice, especially to small and medium-sized specialized enterprises, expanding innovation and the use of applied research for the rationalization of construction (Building of the Year and RABF, etc.).

The aim of such an analysis is naturally to reveal reserves in the productivity growth of the field. This includes, among other things, the calculation of the total cost of construction, i.e. including operating costs and the promotion of the Industrial Revolution 4.0 in the construction industry. The real Construction 4.0 as a revolutionary change in the centuries-old tradition of the industry is therefore linked to the change in the requirements for buildings brought about by the changing needs of their users, the change in materials and technologies, driven by technical developments, but also by the requirements for the availability of resources and the consequences of the planet's climate change and the possibilities of digitalization and artificial intelligence. An accompanying feature is the dramatic change in employment and the need for various new skills.

The strategy, or the basis for its elaboration, will have to respond to the "renovation wave" announced by the European Union, which should increase the level of construction effort in the renovation of existing buildings and their adaptation to new requirements by up to 3 times. This brings about new strategic changes over the next five years, but also beyond 2035 until 2050. Many decisions will require rethinking the question of resources, not only in terms of energy, but also in terms of materials and human resources.

Purpose of the measure:

The development of the strategy allows to define a vision for the future of the construction industry and to set clear guidelines for its development. This helps create a coherent and cohesive plan that can drive the whole sector forward.

The strategy enables to identify the key areas for investments and resource allocation. It defines the space for innovations and modernization of technologies and practices in the construction industry. It helps the sector keep up with the latest

trends and technological advances.

Development of the construction sector contributes to jobs and business creation. The quality infrastructure provided by the construction sector further promotes economic growth and social development in communities. The strategy can enhance environmental sustainability of building projects, which is crucial at the times when the emphasis is put on environmental protection.

Objectives of the measure:

In order to prepare a strategy for the development of the construction sector, it is necessary to go through several key steps:

It starts with a **thorough analysis of the current situation**, which includes an assessment of the economic, social, technological and environmental factors affecting the construction sector.

Following this analysis, it is essential to **define clear objectives and priorities for future development**. This may include promoting innovation, improvement of infrastructure, increase of energy efficiency and environmental sustainability management.

Another important step is to **involve various stakeholders** such as government authorities, industry partners, academic institutions and civil society in the strategy development process. This collaboration allows for different perspectives and ensures that the strategy is comprehensive and feasible.

Once the strategy has been developed, it is crucial **to monitor its implementation**, provide regular evaluation and allow for adaptation according to current needs and changes in the surrounding environment. Overall, careful preparation, together with communication and flexibility in response to changing conditions and sector needs is essential to meet the objective of elaborating a construction sector development strategy.

<i>Target group:</i> MIT	<i>Optimal date of implementation:</i> 2025
<i>Method of funding:</i> MIT	<i>Type of measure:</i> Non-investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

CZK 20 mil.



Project coordinator:
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Guarantor/measure sponsor for the BUILD UP Skills project:

ABF

Partners of the measure:

(TBA)



Co-funded by the
European Union

Measure No. 4

The concept of Lifelong Learning

Content of the measure (brief description of the problem):

The introduction of new technologies and approaches will require an increase in the skills of construction workers (from workers to top managers). Training processes will thus necessarily become one of the major activities of construction companies in the next decade. The system of continuing adult education will play a key role in ensuring the improvement of workers' skills.

Construction industry is a field where technological progress is very rapid. Lifelong learning enables workers to keep up with ever-changing technologies, working methods, new legislation and technical standards. Construction workers can improve their skills and qualifications through lifelong learning. This increases their job market attractiveness and improves career progression opportunities.

Lifelong learning helps workers understand new sustainable technologies and methods, which is increasingly important at a time when the emphasis is placed on the environmental aspects of construction.

With lifelong learning, employees are able to respond quickly to new trends and market demands. This increases the chances of success and maintaining a job in a competitive environment.

Lifelong learning in the construction industry therefore ensures that workers are prepared for the challenges and opportunities presented by a rapidly changing industry and helps them maintain their professional relevance and the quality of their work.

It is also crucial to strengthen the education system of teachers themselves in the light of the forthcoming changes in society.

Purpose of the measure:

The purpose of the measure is to launch LLL with regard to the dynamics of development in the construction sector, to help eliminate the gap between the current opportunities in individual professions in the construction sector and the requirements for their quality and quantity, which are based on European directives. This is a key step towards meeting the objectives of the BUILD UP Skills programme in the Czech Republic.

Objectives of the measure:

The objectives of the measure within the concept of lifelong learning are diverse and aim to support the personal and professional development of individuals across age groups.

Improving professional skills: The measures should enable people to acquire new professional skills, develop their professional knowledge and improve their work skills.

Promoting non-formal education: Lifelong learning should include non-formal learning activities such as workshops, seminars and other forms of learning outside the traditional school environment.

Increasing qualifications: the aim is to enable people to gain higher qualifications and certificates that are relevant to the labour market and improve their employability.

Promoting lifelong learning: Measures should promote the idea of lifelong learning, which means that people are motivated to continue learning and developing after they have completed their formal education.

Soft skills development: In addition to technical skills, it is important to develop soft skills such as communication, teamwork, creativity and problem-solving skills.

Support for employers: Measures should motivate and support employers to invest in the training of their employees and promote their professional growth.

Responding to labour market needs: Lifelong learning should be flexible and responsive to the needs of the labour market to provide the skills that are in high demand at the time. Education should support entrepreneurship and innovation, creating the conditions for the establishment of new businesses and development of innovative ideas.

Improving the quality of life: Lifelong learning can contribute to the personal development, self-satisfaction and overall quality of life of individuals.

Target group:

Craft and technical professions

Optimal date of implementation:

2025

Method of funding:

SF, MIT

Type of measure:

Non-investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

CZK 10 mil. CZK for the preparation (2025), 400 mil. CZK/year for the implementation



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Guarantor/measure sponsor for the BUILD UP Skills project:

ČKAIT

Partners of the measure:

(TBA)



Co-funded by the
European Union

Measure No. 5

Effective Public Procurement

Content of the measure (brief description of the problem):

Although the Public Procurement Act does not allow competition exclusively for the lowest price, unfortunately in practice it still happens by setting a high weight on the price criterion, which makes the other criteria formal. The **National Strategy for Public Procurement in the Czech Republic**, approved by the Government of the Czech Republic on February 21, 2024, promises to change this method of evaluation, when public procurement should be oriented towards maximizing the so-called value for money. Practice will show whether public contracting authorities will apply procedures in the intended sense of the law to public contracts.

In order to achieve effective public procurement, **methodical support** and educational and educational activities of contracting authorities, suppliers and designers are essential. A well-set methodology will then encourage, for example, the inclusion of lifelong learning within the requirements of the tender procedure, either for service contracts (projects) or construction work contracts. This would encourage **continuous educational and professional development**.

An appropriate methodology will also support innovativeness and creativity within the framework of public procurement, for example, by expanding the use of the performance design and build method, design competitions, the best value approach method or competitive dialogue.

Preparing a clear and **effective methodology** for managing competitive dialogue will improve communication and dialogue between contractors and suppliers.

In general, it would be advisable to simplify the formulation of the law. The complexity of preparing for the selection of a contractor has reached such a level that a public contracting authority (e.g. a municipality) cannot do without the services of a law firm even for smaller contracts for construction work. However, due to their focus, these neglect the technical and functional requirements for the final work. The Czech Republic's national strategy for public procurement aims at professionalising the award of public contracts, expanding central contracting and providing methodical support to small contractors.

Purpose of the measure:

- Ensure more qualified suppliers by requiring lifelong education in terms of technical qualification;
- determination of behavior in subcontracting chains;
- ensure a clear specification of the subject of public contract performance - the standard is an essential basis;
- competitive dialogue will provide the contracting authority with a clearer specification of the project work, including all risks.

Objectives of the measure:

- Provide public procurement contractors with better input of documents for the awarding of contracts for construction works and ensure the management of design or construction contracts by qualified contractors;
- strengthen methodical support for the awarding of public contracts;
- ensure the possibilities of reference to standards that will provide the contracting authority with a clear assignment.

Target group:

Municipalities
 Public procurers
 Authorized persons

Optimal date of implementation:

2024

Method of funding:

-

Type of measure:

Non-investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

Tens of thousands of crowns. These are soft measures.
 Methodology for competitive dialogue within hundreds of thousands of crowns.
 ČKAIT may participate in the competitive dialogue.

Guarantor/measure sponsor for the BUILD UP Skills project:

ČKAIT

Partners of the measure:

(TBA)

Measure No. 6

Support for research in the construction sector

Content of the measure (brief description of the problem):

The Czech construction industry stands at a crossroads. The sector is facing fundamental changes in society to which it must adapt. We are struggling with a critical shortage of new housing construction, while failing to meet national energy saving targets. The current rate of complex renovations is around 1% per year while the appropriate rate would be at least three times more. Meeting the national Minimum Energy Performance Standard (MEPS) target would mean increasing the rate of complex renovations up to six times.

The interest in construction fields in secondary and higher education has been declining for a long time and the number of graduates covers about half of the workers leaving the construction industry. The long-term deficit is partly compensated by foreign workers, especially from Ukraine, who may leave quickly as the country begins to recover. There has been a long-term failure to increase labour productivity. While other sectors are adopting new technologies at an increasingly rapid pace, going digital, introducing robotics and artificial intelligence, the construction sector is lagging behind.

Not enough attention is paid to innovations that would enable adaptation and overcoming barriers. They are perceived as expensive and there is low demand from investors. Meanwhile, the construction sector is one of the pillars of the economy. It is crucial to meeting the goals of energy saving, climate protection and accelerating the decarbonization of our economy.

Purpose of the measure:

In order to play its role in the economy, the construction industry needs to systematically innovate along the entire value chain. The key is to focus on innovations on specific sites that will lead to an acceleration of new constructions and an increase in the pace of renovation. The traditional pace of construction (e.g. a single-family house in 2 years) cannot be acceptable. Support for research, development and innovation in the areas of robotics, digitalization of construction processes, 3D printing on specific construction sites, with the aim of adopting new techniques, and other areas is therefore essential.

The support for innovations can be carried out through the Technology Agency of the Czech Republic (TACR), ideally through a public support programme structured similarly to the THÉTA energy support programme. That is, in two axes, namely for research projects initiated by the public sector, in particular by the MIT, MoE and MRD, and those initiated by enterprises themselves – in analogy to sub-programmes 1 and 2 of the THÉTA programme. The programme's objective would be to introduce new technologies and practises on specific sites as well as increase of competitiveness, efficiency, technological equipment and so far low productivity of the sector. A positive result of the programme would be the creation of modern

attractive positions in the construction industry.

Objectives of the measure:

Develop a plan to support investment incentives for the introduction of cutting-edge innovations.

Develop a programme of strategic investment in the industrialization of construction manufacturing.

Support of training and construction process digitalization, use of the multiplier effect of investment in the construction sector.

Target group:

Construction companies
 Employees in the construction industry

Optimal date of implementation:

2025 to 2030

Method of funding:

TACR, MIT, MoE, MRD

Type of measure:

Investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

CZK 0.5 billion/year

Guarantor/measure sponsor for the BUILD UP Skills project:

SEVEn

Partners of the measure:

(TBA)

Measure No. 7

Involving women in the construction sector

Content of the measure (brief description of the problem):

Women in the construction industry are rare. There are several reasons for this – from minor obstacles such as inadequate safety equipment at work to deeply ingrained social norms – there is a lack of support and acceptance in predominantly male teams, and more physically demanding jobs are traditionally considered inappropriate.

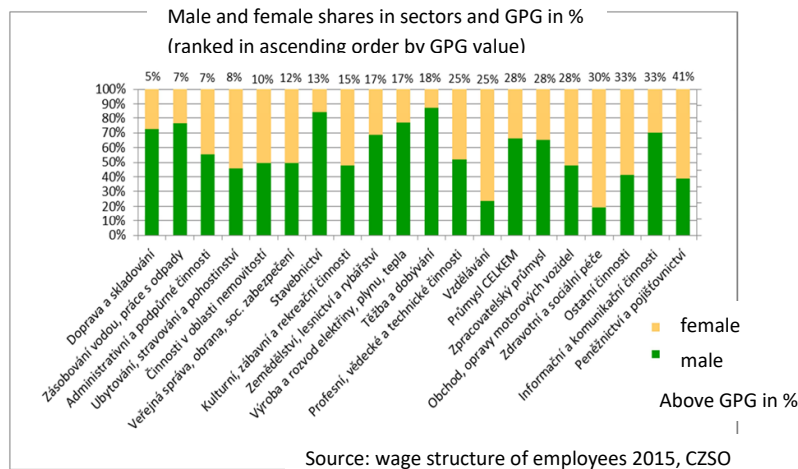
Significantly fewer women than men work in the construction industry. According to the CZSO, the average share is 10%, which is comparable to other EU Member States (9%). According to the CZSO, 395,400 people were employed in the construction sector in 2020, of which 35,800 (9%) were women. In 2021, 39,200 women (9.5%) out of a total of 413,400 persons were employed in the construction sector. In 2022, 33,700 (8,3%) women out of a total of 406,500 persons were employed in the construction sector.

The source "Project 22% Towards Equality" (MoLSA), which, among other things, dealt with the share of women in individual professions, states that in the construction industry women are more likely to work as civil engineers (20%), cartographers/surveyors (37%), and construction technicians (20%). In craft professions like bricklayer, reinforced concrete worker, concrete worker, joiner, tile setter, carpenter, plumber, and painter the share is zero. Women are represented in the occupations of crane operator (26%), assistant surveyor/excavation worker (4%), or building construction worker (2%).

0.9% of female graduates from construction vocational schools complete their vocational certificate, while 32% of female graduates from construction vocational secondary schools successfully complete their school leaving certificate (maturita) every year. In the long term, female students account for an average of 30% of the total number of students at universities specializing in construction and architecture. This proportion is higher in architecture-oriented programmes, while in construction-oriented vocational programmes it is lower.

Example: According to the Annual Report, 987 women (32%) and 1,619 men (68%) study at the Faculty of Civil Engineering of the CTU in Prague (as of 31 October 2022). The share of women in the total number of students differs in individual bachelor study programmes – the Architecture and Building Engineering programme is studied by 59% of women, Geodesy and Cartography by 37%, Civil Engineering by 30%, Construction Management and Economics 33%, but the professional programme Civil Engineering by only 15% of women. 62% of women study Architecture and Civil Engineering, 33% of women study Geodesy and Cartography, and 31% of women study Civil Engineering in the follow-up Master's degree programmes.

Gender Pay Gap in the Czech construction industry is approximately 13%, which is one of the lowest GPGs in the national economy.



Transport and storage; Water supply, waste management; Administrative and support activities; Accommodation, catering and restaurant services; Activities in the field of real estate; Public administration, defence, social security; Construction sector; Cultural, leisure and recreational activities; Agriculture, forestry and fishing; Electricity, gas and heat production and distribution; Mining and extraction; Professional, scientific and technical activities; Education and training; Industry in TOTAL; Manufacturing industry; Business, motor vehicle repair; Health and social care; Other activities; Information and communication activities; Finance and insurance

Proposal for the measure:

7.1 Supportive and inclusive work environment

- Support diversity and inclusion training programmes (to understand unconscious biases and encourage open discussion on gender issues in the workplace);
- Introduce transparent and fair recruitment and promotion (without prejudice)
- Promoting open dialogue and addressing gender stereotypes (between employees and management);
- Providing safe and harassment-free workplaces (establishing clear policies and procedures to prevent and address harassment, as well as promoting a culture of zero tolerance for such behaviour).

7.2 Improving access to education and skills development

- Strengthening STEM education for girls and young women;
- Develop targeted apprenticeship and training programmes (construction companies should develop apprenticeship and training programmes specifically adapted to attract and retain talented women – to help bridge the shortage of skilled workers and equip women with the necessary technical and soft skills for a successful career in construction);
- Encouraging women to attend industry related events – conferences (networking, visibility, skills development, mentoring and career advancement ...);
- Scholarships for women pursuing a career in construction.

7.3 Facilitating work-life balance

- Introducing flexible working arrangements;

- Offering childcare support (on-site childcare facilities or financial assistance for childcare services);
- Providing career development and training opportunities for managers (training, development programmes and leadership opportunities);
- Introducing mentoring and networking initiatives (valuable mentoring, support and contacts in the construction industry).

7.4 Use of technologies to overcome differences between men and women

- Use of digital platforms for recruitment and skills development (online training programmes, job boards, recruitment campaigns targeting women);
- Introducing virtual reality and simulations tools for training and upskilling (safe and controlled environments for learning and practice, overcoming the barriers posed by traditional on-site training methods);
- Promoting the adoption of automation and robotics to alleviate physical workload (overcoming gender barriers, encouraging a more diverse workforce in the industry)
- Promoting women's entrepreneurship in construction technology and innovation.

Measures by target groups:

- A) Female students (... and their parents) – to motivate them to enter the construction industry
- Primary schools: a targeted campaign, excursions, sharing personal experience, NO to gender stereotypes ... example: Girls' Day ... – the goal is to promote professions that are not considered "suitable for girls" in a gender stereotyped optic and thus motivate girls to study them
 - Secondary schools: a targeted campaign, sharing of personal experience, scholarships (construction company)
 - Universities: a targeted campaign, sharing personal experience, scholarships (construction company)
- B) Female graduates from secondary schools and universities on/after parental leave skilled workforce) – facilitate the return to a qualified job:
- "updating" of qualifications or professionalism (... courses)
 - help with childcare during working hours - day nurseries/preschools/after school care (družina)/ children's groups (... subsidies for running a day nursery/children's group or company tax relief)
 - Working from home, part-time job, flexible working hours, shorter working week ... (employer's tax advantage as in the case of employment of disabled people – has to be proven when participating in a public tender for construction work or services (designer))
- C) Unemployed women

- increase the proportion of women working on construction sites doing manual jobs that do not require physical strength, i.e. skilled craft work, especially in the finishing phase of constructions, e.g. tiler, plasterer, painter, wooden/laminate floor layer, coated floors fitter, tinsmith, locksmith, stucco worker ...
- targeted campaign to increase the proportion of women in specialized courses (retraining)
- training of lecturers (inclusion of women in the team of trainees, overcoming gender stereotypes)
- adaptation of the building facilities - separate changing rooms, toilets, washrooms for women, work clothes, etc.
- "education" of male colleagues – company / "construction site" culture, respect for female colleagues and female superiors

Promote women's strengths (diligence, attention to detail, quality of work, respecting OSH)

Objectives of the measure (the effect of gender diversity on the construction industry):

- Better problem solving and decision making (different perspectives and experience)
- Increased creativity and innovation
- Strengthening the company's reputation and competitiveness in the market (adopting gender diversity can improve the company's reputation, attract top talents, clients and investors).

A positive impact on sustainable development in all 3 pillars – the Environment, Economy, Social area. Within the economic pillar, reducing the costs associated with unemployment benefits, reducing the cost of construction (female graduates of the courses will have knowledge of low-energy and energy-efficient construction, which they will apply in the design of buildings). Under the social pillar, the integration of women (especially after returning from parental leave) into the work team, increasing professional confidence. As part of reducing the environmental impact, designing energy-efficient buildings, use of RES and recycled material, reducing CO₂ will be promoted.

Women represent a huge potential for the construction industry.

Target group:

Graduates – women educated in construction professions of universities and colleges

Primary and secondary school pupils and students, parents

Unemployed women – adepts for retraining for a construction profession

Optimal date of implementation:

2025 to 2030

<i>Method of funding:</i> MoLSA, FRLZ "European funds"	<i>Type of measure:</i> Non-investment
<i>Estimated total costs for implementing the objectives of the measure (investment/non-investment):</i> 20 mil. CZK/year for the campaign	
<i>Guarantor/measure sponsor for the BUILD UP Skills project:</i> CTU	
<i>Partners of the measure:</i> (TBA)	

Measure No. 8

Support for structurally weaker regions

Content of the measure (brief description of the problem):

Support for structurally weaker regions in relation to education in Czech construction and the possibility of shifting employment from the primary sector to the construction sector

Construction industry plays a key role in the economic development and growth of regions. One of the important aspects is to support structurally weaker regions, which often suffer from underemployment and limited opportunities for economic growth. This support can be linked to training and the shift of the workforce from the primary sector to the construction sector.

Structurally weaker regions are usually characterized by lower economic development, lower income of the inhabitants and limited employment opportunities. These regions in the Czech Republic include particularly:

- North-West Bohemia (Ústí nad Labem and Karlovy Vary region): this region has a long history of coal mining and heavy industry, which, however, is gradually losing its importance. Changes in the energy sector are leading to the need to retrain workers for other sectors.
- North Moravia (Moravian-Silesian Region): Similar to Northwest Bohemia, North Moravia is facing a gradual decline in heavy industry and job losses.

The development of unemployment in these weaker regions has historically been problematic. However, efforts to diversify the economy and increase employment in the construction sector can help to reduce the unemployment rate and create new opportunities for local people.

Impact of unemployment rate in weak regions of the Czech Republic

This chapter is based on the [press release of the Labour Office of the Czech Republic](#) from September 2023.

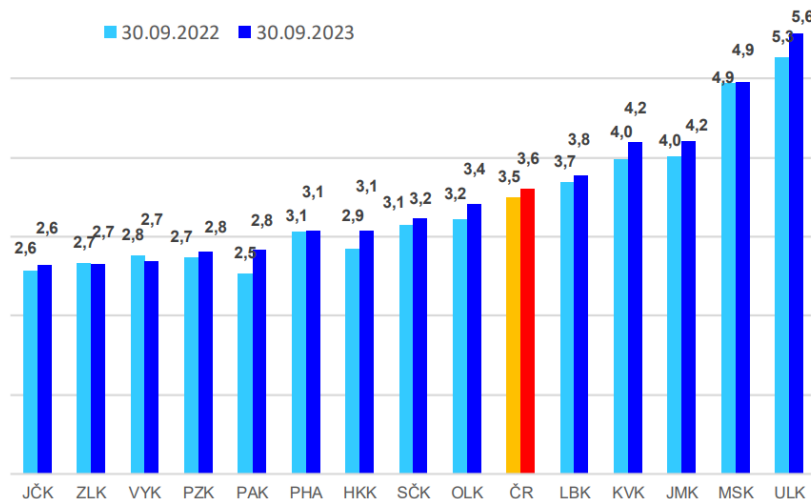
In September 2023, the highest share of unemployed people, considered as the available jobseekers aged 15-64, was in Ústí nad Labem (5.6%) and Moravian-Silesian Region (4.9%). These regions had the highest share of unemployed persons in the same period last year. By contrast, the lowest unemployment rate was in the South Bohemia Region (2.6%). The average unemployment rate in the Czech Republic is 3.6%

In terms of the level of education, jobseekers with lower qualifications, especially those with an apprenticeship without a secondary school leaving certificate (maturita) and with primary education, were most often unemployed.

These facts give a relatively small potential to attract unemployed people to the construction sector for "new" fields requiring higher levels of education, and especially for fields in areas with higher levels of digitalization.

At the same time, the labour market shows that employers are mostly interested in building construction workers, forklift truck operators and warehouse workers, assembly workers, truck and tractor-trailer drivers, cooks, cleaners or bricklayers, stove fitters and tilers. The highest demand for new employees is in Prague (85 thousand jobs) and the Central Bohemian Region (55 thousand jobs).

Unemployment in the regions in 2022 and 2023 (source: Labour Office of the Czech Republic press release):



Purpose of the measure:

The purpose of this measure is to bring new employees to the construction sector in weaker regions. Support for education and training of workers is crucial for their upskilling and professional development. Promotion of new job opportunities also encourages development of the region.

Objectives of the measure:

Main steps to support construction in weaker regions

Infrastructure investment is the first step to the support of these regions. Modernization of transport, telecommunications and other key areas help open new opportunities for business and employment. The establishment of infrastructure projects requires a large amount of workforce, which can significantly increase employment in the region. The speed of preparation of infrastructure projects in the Czech Republic is very low in comparison with the neighbouring countries.

Another important factor is education. An educated workforce is more likely to get quality jobs in the construction sector. Regions should invest in vocational education and training to ensure that local people have the necessary skills and qualifications to work in the construction industry. This can include courses for traditional construction trades such as bricklayers, plumbers and roofers, as well as professionals such as insulation technicians, technology equipment installers and experts in installing and commissioning measurement and control systems. Other opportunities

are in the "new" fields related to digitalization – artificial intelligence, various types of virtual reality, automation and robotics in the production of materials and components and in the construction of buildings itself. These modern trends in the construction industry could play a key role in employee recruitment not only in these regions. Support for education and vocational training in the area of modern technologies can provide young people in weaker regions with attractive job opportunities in construction. A joint effort of the public and private sectors can achieve sustainable economic development of the construction sector.

On the whole, supporting structurally weaker regions in the construction sector and shifting employment from the primary sector to the construction sector is a long-term process that requires a comprehensive approach. Investment in infrastructure, education, entrepreneurship and environmental sustainability are key elements of this strategy. Only by combining these factors regions can achieve sustainable economic development and increased employment.

To promote these opportunities in weaker regions it is necessary to invest in modern education and improving access to the internet and digital technologies. In addition, it is vital to provide financial support for start-ups and small-sized enterprises in the area of construction that focus on innovations and technological development. In this way, we can promote sustainable development in these regions and reduce unemployment.

An example of ongoing subsidy support for education at the level of secondary education and lifelong learning is the Regional Operational Programme on Educational Infrastructure, which aims to support regional education, especially the expansion and improvement of school infrastructure for education in relation to, among other things, polytechnic education. The relevant specific objective includes improving equitable access to inclusive and quality education, training and lifelong learning services through the development of accessible infrastructure, notably by strengthening resilience for distance and online education and training. CZK 14.1 billion is available for the period until 2027. The condition for such support is the existence of relevant local, provincial or regional education action plans. In the last 8 years, the Moravian-Silesian Region has benefited most from such support, with 463 projects worth CZK 2.6 billion, generally related to the promotion of education. In the private sphere, the CEZ Foundation, for example, supports educational activities in the regions.

Besides subsidy support, specific legislative and administrative support from the state is needed. The proposal for measures to support and make secondary vocational education more attractive dates back to 2013, which implies that the proposal should be updated.

The proposal for new measures to support vocational education, approved by Resolution No. 8 of the Government of the Czech Republic of 9 January 2013 and set out in Part III of document No 1329/12 submitted by the Ministry of Education, Youth and Sports, can be downloaded from this link:

<https://www.msmt.cz/vzdelavani/stredni-vzdelavani/navrh-novych-opatreni-na->

[podporu-odborneho-vzdelavani](#)

Target group:

- a) Construction workers, employees, self-employed persons
- b) People from other fields, unemployed

Optimal date of implementation:

2025 to 2030

Method of funding:

MoLSA

Type of measure:

Investment

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

200mil CZK/year (20 mil. CZK for the campaign)

Guarantor/measure sponsor for the BUILD UP Skills project:

CZGBC

Partners of the measure:

(TBA)

Measure No. 9

Changing the face of the construction sector

Content of the measure (brief description of the problem):

The construction industry, as a key element of social development, faces a negative reputation at times. In public opinion, it is often perceived as a sector with a problematic image. This unfavourable perception is often linked to a fixed impression that can be characterized by the three Ds – 'dirty, dangerous and degrading', which reflects the disadvantages of the industry. Although measures are being taken in the industry to improve safety and working conditions, there is still much work to be done to change the public perception of the construction industry and to eliminate the negative aspects that accompany the sector. There is a need to remove the established notion of 3D construction and introduce the new face of Construction 5.0, as a new approach to building and managing construction projects that uses modern technologies and digital tools to improve efficiency, sustainability and safety in the construction industry, integrating modern technologies such as artificial intelligence (AI), the Internet of Things (IoT), augmented reality (AR), virtual reality (VR) and big data, at different stages of the construction process.

Purpose of the measure:

The construction sector plays a crucial role in the growth of economy but is tackling numerous challenges, including negative public perception. It is essential to make changes that will not only change this image but also improve working conditions and overall efficiency of this sector. Modernization of construction sector is necessary not only in terms of technological progress but also to change public perception of the sector. It is high time to overcome prejudices and see construction as an attractive and promising field of work. Once we change the way we perceive and work in the construction industry, we can transfer this change to the public.

Modern technology, such as 3D printing on the construction site, robotization and augmented reality offers revolutionary ways to approach construction projects and enables the construction industry to move from being just an industry of physical labour to one of innovations. This technology allows for a creative approach to solving construction challenges, which increases the attractiveness of working in this sector.

Investment in education and training gives employees in construction opportunity to improve their skills and acquire specialized knowledge. Qualified professionals are the key to success and by being well prepared they will have greater confidence and enjoyment at work.

Construction is much more than just putting up walls and concrete panels; it is a dynamic and diverse industry that forms the backbone of our modern society. Every project in this sector is unique, which is why the construction industry is also a laboratory of innovation and creativity. This field is not limited to work on the construction site. On the contrary, it offers an incredibly wide range of career

opportunities that bring together the diverse interests and skills of individuals.

Changing the perception of construction as an innovative and respected industry starts within the industry. When workers take pride in their work and have access to modern technology and opportunities for career growth, this positive perception is passed on to the public. Construction has the potential to be an industry in which people are happy to work if they are given a fair opportunity and motivation to excel.

Objectives of the measure:

Information campaign on the construction industry:

Creation of a public information campaign highlighting the importance of the construction sector to the economy, society and the environment.

- Promoting careers and opportunities in the construction industry through television, social media, flyers, billboards and online platforms.
- Creating an interactive website with information about the construction industry which contains articles, videos, interviews with experts and stories of successful people in construction.
- A smart phone app providing regular updates on events, courses and construction projects.
- An active social media presence where motivational stories, infographics about various construction professions, and event and workshop highlights are shared.
- Hashtag campaigns to share posts and stories about the lives of construction workers.

Workshops and seminars:

- Organizing interactive workshops in schools where construction experts present their work, demonstrate technologies used in construction and answer students' questions.
- Seminars for parents to inform them about career opportunities in the construction industry and the benefits of construction careers.

Motivation for parents:

Workshop sessions for parents to inform them about the benefits of building careers for their children.

Sharing updates with parents about the construction industry, including career options, financial opportunities and the importance of the industry to society. Knowing about real opportunities can convince parents of the benefits of the construction trades.

One way can be to organize Construction Career Days where parents and their children can talk to construction professionals, get information about different construction careers and learn about universities offering construction education;

bring successful construction professionals into the school environment who can tell their success stories. Inspiring examples can show parents what a long and satisfying career the construction industry can offer.

Communication about the importance of the construction industry to society, how it contributes to the development of infrastructure, economy and employment. Construction is a sector that offers many diverse career options and can be an inspiring and fulfilling choice.

Establishing support programmes at primary schools:

Workshops and presentations in schools to introduce different professions in the construction industry and help students better understand what the professions entail.

Career counseling for students to help them discover their interests and abilities and connect them to appropriate construction occupations.

Preparatory courses and week-long internships in partnership with construction companies to give students hands-on experience and an understanding of the skills needed in the construction industry.

Construction Weeks: organizing special "Construction Weeks" in primary schools, during which students will be involved in construction projects, games and competitions. Visits to construction companies and building projects to learn about the work of construction professionals and real construction projects.

Mentoring programmes where experienced construction professionals help and advise young people at the start of their careers.

Creating a platform to share experience and stories of successful people in the construction industry to provide inspiration and motivation to young people.

Promoting the modernization of teaching: Improving the curricula in the construction disciplines to reflect modern technologies and methods used in the construction industry.

<p><i>Target group:</i></p> <p>Public</p> <p>Workers in the construction sector</p>	<p><i>Optimal date of implementation:</i></p> <p>2025 to 2030</p>
<p><i>Method of funding:</i></p> <p>MIT, MoEYS, ESF</p>	<p><i>Type of measure:</i></p> <p>Non-investment</p>
<p><i>Estimated total costs for implementing the objectives of the measure (investment/non-investment):</i></p> <p>CZK100 mil. /year</p>	



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Guarantor/measure sponsor for the BUILD UP Skills project:

SEVEn

Partners of the measure:

(TBA)



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Measure No. 10

Introducing systematic data collection in education

Content of the measure (brief description of the problem):

A significant obstacle to the quality management of skills development in the construction industry is the lack of commonly available, reliable and according to a uniform methodology long-term statistical data concerning:

- a) Number of students in secondary vocational schools by individual trades;
- b) Number of people working in the construction industry by individual trades.

When preparing the SQA, it was necessary to work with expert estimates in the case of secondary school students, supplemented and revised by findings from a sample survey of some secondary school principals. In the case of the employment structure, its estimation was built on the basis of the "EU 2020 Labour Force Survey" carried out by the CEDEFOP agency, confronted with the results of the "Employment development in the construction sector" according to the national accounts (both surveys, however, work with a rough and, moreover, mutually different occupational structure), while the "finer structure" of occupations was obtained by subsequent disaggregation (calibration) based on the number of members of individual professional communities and the number of trades in the construction sector registered by the MIT, then supplemented by data from the statistics on wages in the construction sector, kept at the MoLSA.

In both cases, it was eventually possible to obtain the (necessary for SQA) data in the required detail and with sufficient precision, but the process of obtaining them is extremely laborious and always raises methodological question marks – especially if we were to try to obtain methodologically consistent data series over a longer period.

Prior to 2012, both the number of students and the number of workers (in the corresponding structure) were commonly published by the Czech statistical service. The content of the given measure can therefore be briefly defined as a return of the monitoring of the number of students and the number of staff to the normative situation before 2012.

In practice, this means that in the case of:

- a) **Statistics of students** the MoEYS shall be entrusted with the collection of data obtained from individual Regions, which, as the founders of (most) vocational secondary schools, would collect (with annual frequency) the numbers of students (enrolled, studying, graduates) according to the codebook of the **System of Fields of Education in Primary, Secondary and Higher Vocational Education**, as set out in Annex 1 of Government Regulation No.211/2010 Coll.
- b) **Statistics of workers** the CSU shall be entrusted, in agreement with the MIT, with the creation of a codebook of occupations, which would subsequently be applied within the framework of the "Labour Force Sample Survey" (LFSS), which has been carried out by the Czech Statistical Office since December 1992. The code will have to be redesigned in cooperation with the CZSO and

<p>the MIT. Previously (until 2012) this task was assigned to URS CZ a. s., which is no longer the case.</p>	
<p><i>Purpose of the measure:</i></p> <p>To equip competent public administration authorities at central and regional level, business associations, professional associations and educational institutions in the construction industry with a high-quality and commonly available data base, enabling them to provide long-term (i.e. on a stable and consistent methodological basis) information on the development of the structure of professions in the construction industry, and thus to equip these institutions with the ability to respond strategically and tactically to the development of the labour market in the construction industry.</p> <p>The ABF Foundation, in cooperation with business associations and occupational associations, will coordinate the preparation of the implementation of the Measure. However, the cooperation of the MoEYS, MIT, MoLSA, CSO and the Association of Regions is crucial for the actual implementation of the Measure.</p> <p>Given the nature of the Measure (organizational within the public administration), its financing from a subsidy program (current, even after 2027) does not seem likely at the moment.</p>	
<p><i>Objectives of the measure:</i></p> <p>Ensure the common availability of statistical data on trends in the number of vocational secondary school students and the number of people working in construction, both in a 'fine' structure of disciplines and skills.</p>	
<p><i>Target group:</i></p> <p>Managers of public administration institutions with competences in relation to construction and construction education (MoEYS, MIT, MoLSA, CSO and Association of Regions),</p> <p>Officials of occupational associations and business federations</p> <p>Principals of secondary vocational schools and other educational and research organizations related to the construction industry.</p>	<p><i>Optimal date of implementation:</i></p> <p>Establishment and approval of statistical tracking classification code lists: 2024</p> <p>Organizational preparation: 2025</p> <p>Start of statistical monitoring: 2026</p>
<p><i>Method of funding:</i></p> <p>From their own resources of MoEYS, MIT, MoLSA, CSO and Association of Regions.</p>	<p><i>Type of measure:</i></p> <p>Non-investment – organizational</p>

Estimated total costs for implementing the objectives of the measure (investment/non-investment):

Preparatory works (2024-2025) CZK 2.1 million – non-investment, one-off

Implementation (from 2026) CZK 12.5 million/year – non-investment, annually

Guarantor/measure sponsor for the BUILD UP Skills project:

ABF Foundation

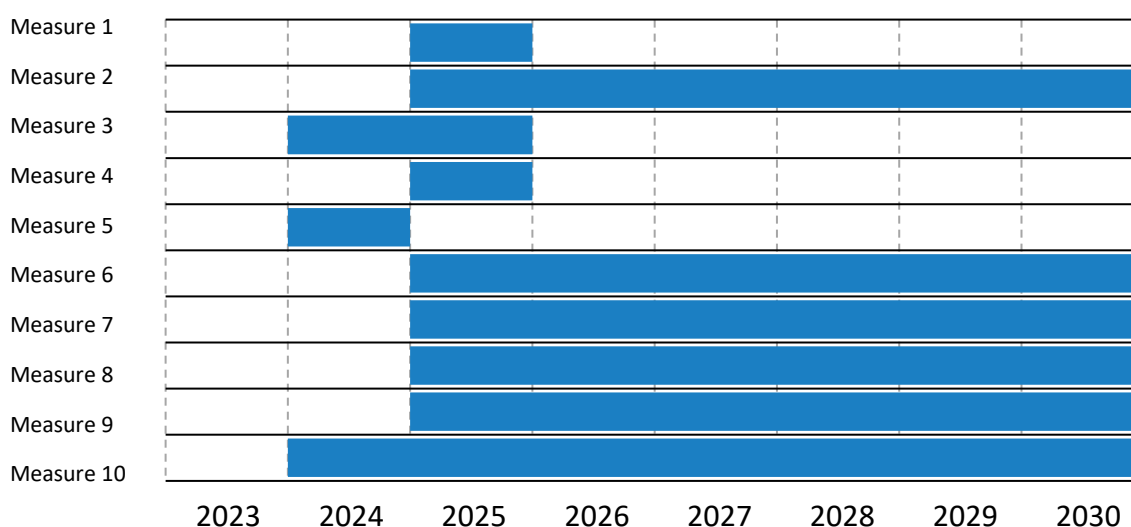
Partners of the measure:

MoEYS, MIT, MoLSA, CSO and Association of Regions, SPS, HK ČR, occupational associations, educational institutions

7.2. Schedule of the Action Plan

The timeline below shows the time schedule of the individual measures. For some measures, for example, the development of strategies, concepts and laws, a period of one to two years is assumed. The other measures are expected to be implemented continuously until 2030. The measures Elaboration and implementation of the education strategy, Effective Public Procurement and Introduction of systematic data collection have clear prerequisites, and thus should already occur in 2024, the other measures need longer preparation, and therefore, they are expected to start in 2025.

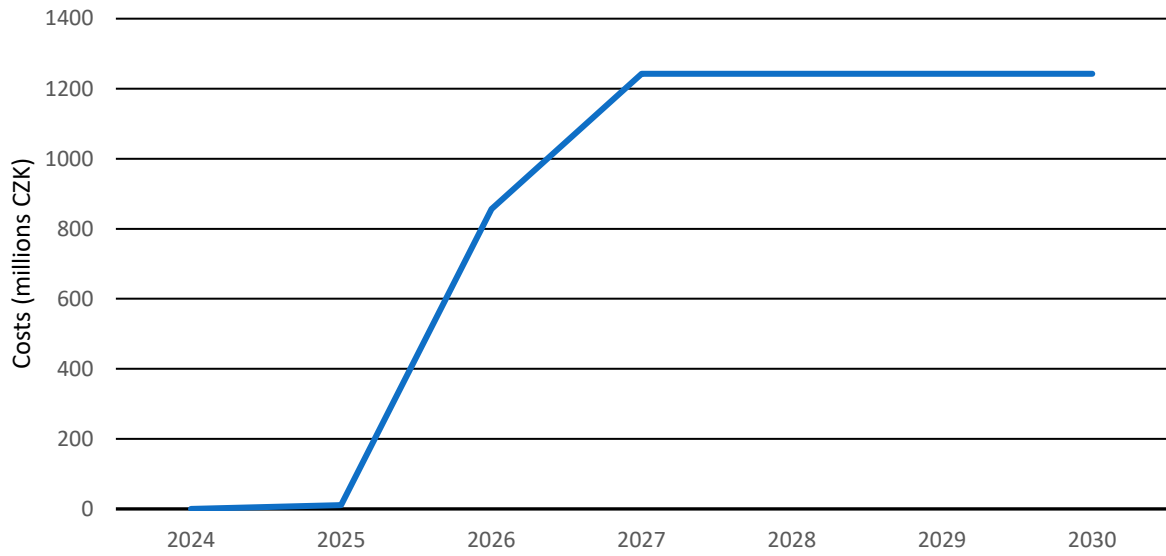
Figure 2 Schedule of Action Plan activities



7.3. Proposal for the financing of activities and their sustainability

The financing of two measures starts in 2024. In 2025, the financing of all other measures is added. After 2026, although some costs will be slightly reduced by measures with a duration of one to two years, the total annual costs will rise due to the expected high costs of implementing other measures. For example, for the measures regarding the education strategy in the construction industry, 5 million CZK is expected for the elaboration of the strategy in 2025 and then 10 million CZK for its implementation every subsequent year. The situation is similar with the measure Introduction of systematic data collection in education, where preparatory work is expected in 2024-25, which will need investments of 2.1 million CZK, and subsequent implementation of the measure from 2026 is estimated at 12.5 million per year. Or for the introduction of the concept of lifelong education, where up to 400 million CZK per year is expected to be implemented from 2026. The total estimated costs are shown in the chart below.

Figure 3 Annual costs of the action plan



8. Monitoring

Monitoring will guarantee the implementation and fulfillment of the here proposed measures after the end of the project. The main role will play the established national qualification platform (NQP) in the first place. NQP was established in Slovakia and the Czech Republic and its members are employers (companies) in the building sector, educational institutions, professional chambers and non-profit organizations promoting the increase of energy efficiency and the share of renewable energy in the construction industry. The main task of the NQP are to ensure the professional body of the project, the dissemination of the project and the involvement of interested parties.

It is evident that the project required the involvement of relevant stakeholders in project activities and mutual agreement between key stakeholders on individual measures. NQP members participated and approved the output documents (Status Quo Analysis and Roadmap) of the project and showed interest in individual activities to achieve the project goal with a vision of long-term sustainability of their work at least until 2030. Each measure has the guarantor from the consortium and the partners that supports the measures.

The Czech Ministry of Industry and Trade, Department of Construction and Building Materials, which supported the project from the beginning and continuously monitors it, will also play a key role in fulfilling the obligations of the Roadmap. Some topics of the project are under the responsibility of the Ministry, and these activities therefore fit directly into its program.

Stakeholders who have expressed their support, both for the entire Roadmap or for individual measures, will also engage themselves in future. In total, 36 stakeholders in the Czech Republic expressed their support. With their signature, they pledged to support efforts to implement the measures of the Roadmap. In addition, bilateral discussions took place with some key stakeholders, which resulted in the definition of follow-up activities, thanks to which the implementation of individual measures will take place. For example, the measure No. 3: Preparation of a strategy for development of the construction sector is to be implemented using the TAČR beta project.

8.1. Endorsement

The Ministry of Industry and Trade, Department of Construction and Building Materials, expressed a positive opinion on the support of the measures, within the framework of their free capacities to offer possible cooperation in the form of providing feedback, especially for measures No. 1: Development and implementation of a strategy for the sustainability of vocational training in the construction sector, No. 4: Concept of Lifelong Learning, No. 9: Changing the face of the construction sector and No. 10: Introduction of systematic data collection. The Ministry for Regional Development, for instance, particularly supports

measure No. 5: Effective public procurement. Further detailed information on obtaining support is provided in D4.5. Following organisations endorsed the Roadmap:

Organization	Type of stakeholder
Ministry of Industry and Trade	Governmental body
Ministry of the Environment	Governmental body
Ministry for Regional Development	Governmental body
CKLOP - Komora lehkých obvodových plášťů	Professional associations
SIA ČR - Stavitelství, inženýrství architektura	Professional associations
Chance for Buildings	Professional associations
Metrostav a.s.	Construction industry
JRD s.r.o.	Construction industry
Trigema a.s.	Construction industry
GEOSAN GROUP a.s.	Construction industry
SWIETELSKY AG	Construction industry
Energie - stavební a báňská a.s.	Construction industry
Energie - nemovitostní a.s.	Construction industry
Knauf insulation s.r.o.	Construction industry
SPS	Professional associations
Czech society of civil engineers	Professional associations
NSC 4.0	Professional associations
ADMD	Professional associations
AVMI	Professional associations
KORE	Construction industry
CTU UCEEB	Education, research and academia
EkoWATT	Construction industry
Heimstaden	Construction industry
KKCG Real Estate, a.s.	Investors and developers
Velux	Construction industry
SPŠ stavební a OA Kadaň	Education, research and academia
Centrum pasivního domu	Associations
Pozemní stavitelství Zlín a.s.	Construction industry
VŠB - Technická univerzita Ostrava	Education, research and academia
Czech Chamber of Commerce	Associations
ReMi Konzult, spol. s r. o.	Construction industry
INOS® Zličín, a.s.	Construction industry
SUBTERRA	Construction industry
STRABAG a.s.	Construction industry
Syner	Construction industry
ARI	Associations

9. Conclusions

The above Roadmap of the state of the Czech construction industry mainly reveals that the sector as a whole is not currently in the best shape. Its performance, number of workers and labour productivity are stagnating and this situation has been going on for so long that some of the some capacity seems irretrievably lost. The pressure to build cheaply ('cheap at all costs) dictated partly by the market (for private investors) but largely by Public Procurement Act (for public investors), brings with it the pressure to reduce personnel costs (especially today, when material and energy costs are rising). As a result, average wages in the sector are relatively lagging behind (from slightly above average 10 years ago to strongly below average today), making the construction sector less attractive, especially for skilled labour. This results in a situation where there has been a long-term outflow of skilled craft occupations (either to other sectors or to retirement), which cannot be replaced even on balance by graduates of secondary vocational and apprenticeship schools. The attractiveness of the sector, especially for young people and women, is also declining. The labour shortage has thus already become a latent condition that severely limits the demands that construction firms can place on the workforce (including its motivation for further training), even within the "traditional" construction industry.

The Czech construction industry has so far been able to respond only marginally to the challenges posed by the demands for energy-efficient construction and the demands for revolutionary process changes in construction (such as digitalization and the application of AI). The Czech construction sector is somewhat unable to concentrate sensibly on strategies for coping with these technical and technological requirements.

Equally "conserved" is the shape of the education system, which is unable to provide the education of workers corresponding to the technical and technological demands of modern Construction 4.0.

The implementation of the international commitments (within the EU) that the Czech Republic has undertaken in the field of energy-efficient construction and renovation cannot be left to the internal forces of the construction industry alone; strong state intervention will be necessary – especially in terms of removing barriers to progress. Two of these appear to be crucial:

- a) the absence of a single administrative institution responsible for the development of the construction sector, and
- b) the absence of a long-term and binding strategy for the development of the construction sector at national level.



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The measures of the Action Plan (Chapter 7) seek to respond fundamentally to the negative trends and to take advantage of the enormous emerging pressure on the construction sector to reinforce it.



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10. Responses and testimonials

Following the public discussions on the analysis of the current situation and the development of the plan documentation, bilateral consultations on each of the proposed measures were also conducted with several important stakeholders who are not part of the National Qualifications Platform. The Roadmap document was overall very positively evaluated. Addressed partners praised the initiative and added to the discussion the following feedback on individual measures.

Measure 1: Development and implementation of the strategy for the sustainability of vocational training in the construction sector

The most frequent response to the implementation of the strategy was the importance of involving all stakeholders in the elaboration process, especially industry partners (construction companies) and educational institutions (technical teachers) and expert groups for technical education (for example, the Association of Entrepreneurs in the Construction Industry). An emphasis was also placed on the political leadership of the strategy which should be unified. A proposal for electronic interconnection of the different ministries (MIT, MoE, MRD) was discussed; better still, the establishment of a single ministry or a department of a ministry that would have the construction agenda under its umbrella. This would ensure the importance of the sector to the public. It was also stressed that the strategy should promote new training programmes and trends, practical applications and new technologies, and most importantly, focus on training of teachers to make the most of the strategy's potential. All this should, as a matter of priority, lead to strengthening awareness of the various career opportunities in the construction sector. Last but not least, the strategy should set the requirements for graduates so that they correspond to professional requirements applicable in practice.

Measure 2: Efficient use of existing funds

This measure was highly emphasised in the discussions, with those addressed agreeing that effective use of existing funds was extremely important. Alternatively, there may be a possibility of restoring unused funds that worked well in the past, such as the use of the prison workforce. Overall, it is necessary to outline a calculation of the future benefits that the sector will bring if it is effectively supported. This will ensure that the objectives of the support and the amount of funding available for the topics in question are well defined, which can have a significant impact on current construction sector.

Measure 3: Preparation of a strategy for the development of the construction sector

The construction sector development strategy should be an official position of the state that would define the development of the construction sector in the long term. In its development, it is important to integrate all processes in construction and make them more efficient by interlinking them. Within its framework, great emphasis should also be placed on

education. The strategy should involve clear objectives and priorities for future development, as well as a detailed analysis of how these measures will be achieved and what the economic and social impacts will be. From a technical point of view, the strategy should be based on innovation, modernization of technologies and practices in the construction sector and should be regularly evaluated and adjusted according to the specific measures leading to its implementation.

Measure 4: The concept of lifelong learning

The importance of technical education and lifelong learning was perhaps the most resonant from respondents. This is because it is an important part of the careers in the construction industry and continuing education should be maintained throughout one's professional life. Responsibility for lifelong learning must be taken by everyone in the sector. First and foremost, the state should provide a sensible concept and support. However, all levels of schools must be involved, including extending cooperation with secondary technical schools. Furthermore, all enterprises should get involved and support their employees. To do this, however, enterprises themselves also need support in order to increase investment in employee training. Equally important is the involvement of professional associations. It would be appropriate to designate a guarantor of lifelong learning, for example the ČKAIT professional chamber, as a self-government authorized by the state, which would take into account the individual requirements of civil engineering and technical professions. Overall, a system of required education for each activity in the construction industry should be introduced and lifelong learning should be promoted in the context of the specific needs of the labour market, including, for example, the introduction of a system of Masters craftsman examinations, the development of soft skills or the promotion of non-formal education. In order to do this, the rich experience of older builders/civil engineers could be used to teach the younger generation. Lifelong education should be focused on real issues of everyday practice, taking into account the development of the field.

Measure 5: Effective Public Procurement

First, it is necessary to establish cooperation between the Czech Chamber of Commerce (CCC) and Office for the protection of competition (OPC/ÚOHS). Overall, more criteria should be emphasized in the selection of construction contractors, such as innovation in the construction industry, emphasis on quality and sustainability of projects, the impact of the circular economy, or even a well-adjusted system of lifelong learning of the enterprise. The project should have a clear assignment and secure qualified contractors. It is also important that the designers' work is consistently monitored by the ČKAIT. Public procurement could be transformed into a public investment law.

Measure 6: Support for research in the construction sector

The support for innovations in the construction sector is important. Research projects should be initiated by MIT, MoE, MRD but also by enterprises themselves. Enterprises have their own development and research with real technical and economic results. Applied research should mainly be supported. This means, in particular, increasing support for investment in advanced technologies, robotization and digitalization. It would be very helpful to develop a programme of strategic investment in the industrialization of construction production in order to maximize the multiplier effect of investment in the construction sector. Support for research should contribute to both the acceleration of construction and the restoration and maintenance of building and other facilities. This in turn will lead to increased competitiveness, efficiency and better technological equipment.

Measure 7: Involving women in the construction sector

This topic was the least discussed among the respondents and there was disagreement whether the low number of women in the construction industry should be considered a problem at all. This statement alone shows the attitude in the Czech construction industry. Those who expressed support for this measure suggested the establishment of comprehensive support that would lead to greater participation of women in construction professions, starting with support to increase the proportion of women studying construction careers at secondary and higher education level and to increase flexibility and opportunities to combine career and family life in their professional lives. Overall, women's interest in construction fields, their adaptation, and the creation of conditions to support professional growth should be encouraged as much as possible. All this while maintaining equal access and without mandatory quotas.

Measure 8: Support for structurally weaker regions

All respondents more or less agreed on this measure that there is a need to increase the availability and quality of education in weaker regions, both polytechnic education at the level of regional education and vocational training courses. Also, investment in completing infrastructure is very important, which could bring more people into attractive jobs. The state and regional administration will play an important role in this measure.

Measure 9: Changing the face of the construction sector

The promotion of careers and opportunities in the construction sector and the implementation of all the points mentioned above will be key to achieving this measure. Companies should have a significant share in this. Cooperation with other organizations such as SPS or NCS 4.0 is important. Raising parents' awareness of education and career opportunities in the construction sector for their children is substantial. Information campaigns on the construction industry, the creation of support programmes in primary schools, workshops and the promotion of modernization of teaching will help to achieve this. Vocational schools need to keep up with the modernization of the field (where the funding for

introducing modern teaching aids is now a limitation). A mentoring programme is also needed. Schools need passionate professionals who can get students excited about the field and who will highlight positive examples of both new buildings and renovations. In addition, information campaigns and workshops must be held to promote careers in construction in the media.

Measure 10: Introducing systematic data collection

Respondents confirmed that information is the basis for quality decision-making in any field. Even more so for a complex industry like construction. It is therefore essential to introduce systematic data collection and use it to understand the state and development of the industry both in the education sector and in the economy as a whole. The availability of statistical data on the development of the number of students and workers in the construction sector will provide feedback from both graduates and, above all, employers, who should have an overview of the competences and employability of incoming graduates in terms of employment. This will also enhance the ability to predict the future development of the number of places and applicants for construction education at all levels of schools. At the state level, this will help in the long term to plan the necessary numbers in individual professions and to support these professions with appropriate tools. The situation is expected to improve with the development of digitalization but data collection must be timely. Cooperation and coordination between the institutions will be crucial in obtaining these data.

11. References

Analysis CEDEFOP 2020 (www.cedefop.eu)

Lifelong Learning for Construction and Architectural Practice, Jan Fibiger, Urbanism and Urban Development; Volume XXVI; Issue 1/2023

CAS (Czech Agency for Standardization); BIM Concept; <https://www.koncepcbim.cz/>

Czech Republic. Decree No. 140/2021 on energy audit

Czech Republic. Decree No. 141/2021 on energy assessment and data recorded in the Energy Consumption Monitoring System.

Czech Republic. Decree No. 264/2020 Coll. on energy performance of buildings.

Czech Republic. Act No. 406/2000 Coll. on Energy management. Collection of Laws of the Czech Republic No. 406/2000. 25 October 2000, Vol. 115.

Czech Republic. Act No. 165/2012 Coll. on Supported energy sources and on amendments to certain acts. Collection of Laws of the Czech Republic No. 165/2012. 31 January 2012, Vol. No. 59, pages pp. 2482-2513.

Czech Republic. Act No. 225/2017 Coll., amending Act No. 183/2006 Coll., on spatial planning and building regulations (Building Act), as amended, and other related acts. Collection of Laws of the Czech Republic No. 225/2017. 27. 2017, Vol. No. 82, pages p. 2514-2581.

Czech Republic. Act No. 3/2020 Coll., amending Act No. 406/2000 Coll., on Energy Management, as amended. Collection of Laws of the Czech Republic No. 3/2020. 11. 11. 2019, Vol. No. 2.

Czech Statistical Office (www.czso.cz) - National accounting database, Labour and wages statistics, Construction statistics.

CKAIT and CZSO. Czech Construction Industry in Numbers 2019. ISBN 978-80-88265-24-5.

CKAIT and CZSO. Czech Construction Industry in Numbers 2019. ISBN 978-80-88265-32-0.

Long-term renovation strategy to support the renovation of the national stock of residential and non-residential buildings, both public and private. Ministry of Industry and Trade. Prague, 2019.

Eurostat database (<http://ec.europa.eu/eurostat/data/database>)

IMPLEMENTATION OF RESPONSIBLE PUBLIC PROCUREMENT IN THE ORGANIZATION. Methodology. Ministry of Labour and Social Affairs of the Czech Republic. Prague, 2019.

BIM implementation concept and conclusions from BIM conferences. <https://www.mpo.cz>.

Ministry of Labour and Social Affairs – National system of occupations

Ministry of Regional Development of the Czech Republic – Public Procurement Information System <https://www.mmr.cz>

Foundation for the Development of Architecture and Construction; Annual Reports 2019-2020, 2021.

National Institute for Education – National Qualifications Framework

National Institute for Education Underlying analytical studies – construction

National Institute for Education – Reports on the evaluation of secondary vocational education. Prague 2022.

National Recovery Plan; MRD <https://www.mmr.cz>

Draft revision of Regulation (EU) No 305/2011 on construction products; 25.5.2022 - <https://www.mpo.cz>

Amendment to the MRD Construction Act (under discussion) 2022 <https://www.mmr.cz>.

New European BAUHAUS; <https://www.mmr.cz>

NSC 4.0: Strategic documents for the launch of the NCS 4.0; <https://www.nsc40.cz>

Renewable energy sources in 2020. Statistical survey results. Ministry of Industry and Trade of the Czech Republic. Prague, 2021.

Looking back and perspectives of the Czech construction industry 1990-2050; Jan Fibiger; The Builder 10/2022

Pact for skills in Construction; 2.3.2022 - <https://www.mpo.cz>

Supporting actions for the digitalization of construction SMEs; 1.3.2022 – EK <https://www.mpo.cz>.

Climate protection policy in the Czech Republic. Ministry of the Environment of the Czech Republic. Prague, 2017.

Project Competence 4.0, Trexima, 2022, Ministry of Labour and Social Affairs.

EU Protocol on Construction and Demolition Waste Management 22.11.2018 - <https://www.mpo.cz>

ABF Foundation rating: excellent, outstanding and good quality; Jan Fibiger; Builder 04-05/2022.

DEVELOPMENT AND IMPACTS OF THE INTRODUCTION OF NEARLY ZERO ENERGY BUILDINGS. SEVEN, The Energy Efficiency Center, z. ú. Prague, 2017.

Association for Architecture and Development. Semi-annual analysis of the construction and housing market. Spring-Summer 2022. www.arch-rozvoj.cz

Association for Architecture and Development. Semi-annual analysis of the construction and housing market. Autumn-Winter 2022. www.arch-rozvoj.cz

State Energy Concept of the Czech Republic. Ministry of Industry and Trade. Prague. December 2014.

State Environmental Policy of the Czech Republic 2030 with a view to 2050. Published by the Ministry of the Environment, Vršovická 65, Prague 10. 1st edition, Prague, 2021.

Building Legislation and Digitalization; Jan Fibiger; Urbanism and Spatial Development/Journal XXVII/issue 6/2020

STRATEGIC FRAMEWORK OF THE CIRCULAR ECONOMY OF THE CZECH REPUBLIC 2040 "A FULLY CIRCULAR CZECH REPUBLIC IN 2040". Ministry of the Environment. November 2021.

Education and Information Centre. Annual report of the CKAIT for 2021. Prague 2022.

Study of the condition of the housing stock of prefab housing in the Czech Republic, CERPAD for MRD, 2009.

National Energy and Climate Plan of the Czech Republic. November 2019.

Web MRD: <https://www.mmr.cz>.

Circular economy principles in building design in relation to Level(s) 15-04/2020
<https://www.mpo.cz>

The introduction of digitalization into practice is accompanied by chaos and confusion, Jan Fibiger; Builder 01-02/2023

12. Glossary

3D model	Digital representation of the physical and/or functional part of the designed building in a structured form (similar to the structure according to ČSN ISO 16739). It contains only geometric data suitable for the visualisation of the building.
AI	Artificial intelligence
AR	Augmented Reality
Automation	It refers to the use of automatic control systems to control technological equipment and processes. In terms of industrialization, it is the step following mechanization. While mechanization provides people with equipment to facilitate their work, automation reduces the need for human presence in performing an activity.
Autonomous transport	Autonomous vehicles, self-driving vehicles
BIG DATA	Big data, large data, large data volumes stored in data files
BIM	Building information management, Building information modeling. It is a design, construction and construction management process that uses electronic object-oriented information.
BIM model	BIM model-digital representation of the physical and/or functional part of the designed building in a structured form (similar to the structure according to ČSN ISO 16739). It may contain geometric and technical or other non-geometric data required for permissible purposes of use. The model is part of the BIM design documentation.
BMS	Battery Management System. It is a system that monitors and manages battery
BMWK	German Federal Ministry for Economic Affairs and Climate Action
OSH	Occupational safety and health
CAFM	Computer Aided FM
CDE	Digital repository for storing and sharing all common information about a building.
CEN	Comité Européen de Normalisation – abbreviation for European Committee for Standardization – ECS, the French abbreviation is Comité Européen de Normalisation – CEN).
CENIA	Czech Environmental Information Agency
CIIRC	Czech Institute of Informatics, Robotics and Cybernetics
Circular economy	It is a concept that is an integral part of sustainable development.
CZ-CC	Classification of construction works
CZ-CPA	Classification of production
CZ-NACE	Classification of economic activities
LLL	Lifelong learning

CSA (ČAS)	Czech Standardization Agency
CCA (ČKA)	Czech Chamber of Architects
ČKAIT	Czech Chamber of Authorized Engineers and Technicians
CNB	Czech National Bank
CZSO	Czech Statistical Office
DSS Data standard	The foundation stone for streamlining information work in the construction industry through standardization in the field of digitization.
Diagnostic process	The role of structure diagnostics in carrying out building and technical surveys in the context of building maintenance, repair and renovation.
DCMSP/DSRUP(Cz abb)	Digitalization of construction management and spatial planning
EAP/EAO – Cz abb	Economically active population
EED	Energy Efficiency Directive 2012/27/EU
EPBD	Energy Performance of Buildings Directive
EQF	European Qualification Framework
ERDF	European Regional Development Fund
ESF	European Social Fund
ETICS	External Thermal Insulation Composite System
EEA	Environmental Education and Awareness
GDP	Gross Domestic Product
GVA	Gross Value Added
MBP	Main Building Production
IFC	Industry Foundation Classes – Open data format for the exchange of building information in building information modelling (BIM)
IoT	(Internet of Things)
MaR	Measurement & Regulation
MT	Ministry of Transport
MRD	Ministry for Regional Development
Modular planning	Building planning based on predefined building modules.
MIT	Ministry of Industry and Trade
MoLSA	Ministry of Labour and Social Affairs
MoEYS	Ministry of Education, Youth and Sport
Mol	Ministry of the Interior of the Czech Republic
MoE	Ministry of the Environment
ABF Foundation	Foundation for the Development of Architecture and Construction
NCS 4.0	National Centre for Construction 4.0
Neural networks	An artificial neural network is one of the computational models used in artificial intelligence. Its model is the behaviour of corresponding biological structures.
NIPEZ	National Infrastructure for Electronic Public Procurement (Národní infrastruktura pro elektronické zadávání veřejných zakázek)
NPI	National Pedagogical Institute

NQS	National Qualifications System
NSP	National System of Occupations
VT	Vocational training
RES	Renewable energy sources
Paperless project	A project without paper documents
Advanced materials	Advanced (functionally and structurally gradient, nanostructured, smart) ceramic materials, polymers, metals and composites.
Prefabrication	Refers to the mass production of building parts, so-called prefabricated parts (i.e. pre-production). It is an activity that is carried out in specialized production facilities (building factories).
Recycling	It is the process of waste management that leads to its reuse. It is the cyclical reuse of waste and its properties as a secondary raw material in the production process.
Revitalization	(From Lat. Re-, again, and vitalis, vital, viable) means to renew and revive.
Robotization	The process of automating production processes using and deploying robots.
FEP	Framework Educational Programme
AAD	Association for Architecture and Development (Sdružení pro architekturu a rozvoj)
Simulation	It is the imitation of some real thing, condition or process in buildings. Rehabilitation, modernization, insulation. Typical urban revitalization programmes involve, for example, abandoned factory and warehouse buildings (brownfields) that are converted into residential buildings, or galleries, etc.
SPS	Union of Building Entrepreneurs (Svaz podnikatelů ve stavebnictví)
BSE	Building services Engineering
UCEEB	University centre of energy efficient buildings
UCM	Use Case Management
UEAPME	European Association of Craft, Small and Medium-sized Enterprises
VTT	Vocational training teacher
IUD? / ÚÚR	Institute of Urban Development Brno (Ústav územního rozvoje Brno)
Virtualization	Virtualization occurs when a simulated computing environment is created instead of a physical one.
VR	Virtual reality
PP	Public procurement
Green energy	Renewable energy sources (RES) are a group of natural resources from which electricity and heat energy is produced

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