BUILD UP Skills - LITHUANIA 2030 (REBOOT)

The Roadmap for Competence Development of the Lithuanian Construction Sector until the Year 2030 v24.03

Partly financed by the European Union

March 2024

The project is co-financed by the European Union

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Prepared by:
Lithuanian Construction Association
Vilnius Gediminas Technical University
Kaunas University of Technology
VšĮ Construction Sector Development Agency
VšĮ Regional Innovation Management Center
VšĮ Digital construction
National Passive House Association
National Electrical Business Association

Project 101076274 — LIFE21-CET-BUILDSKILLS-REBOOT-SKILLS-LT (BuildUpSkillsLT2030)

More information about the implementation of "BUILD UP Skills Lithuania" can be found https://www.statybininkai.lt/lt/projektai/buildupskillslt2030
More information about the "BUILD UP Skills" EU initiative can be found at https://build-up.ec.europa.eu/en/bup-skills
More information about the LIFE program is available https://cinea.ec.europa.eu/programmes/life_en

Thank you

We would like to thank the entire project team and all construction market participants, representatives of business companies, associations, unions, professional self-governments, educational and scientific institutions, ministries, agencies, state enterprises and other organizations who participated in the working meetings and activities of the project, for their valuable thoughts and advice, all kinds of cooperation contributions in the preparation of this Roadmap.

CONTENT

0. Foreword

Implemented between September 2022 and March 2024, the BuildUpSkillsLT2030 (REBOOT) project is a continuation of the EU BuildUpSkills that was first launched in Lithuania in 2012. The goal of this project is to rally the capabilities of business, research, and governmental institutions in the Lithuanian construction sector for the purposes of proceeding with the advancement of a constantly renewable, cutting-edge system of developing competences in the construction sector of Lithuanian, one that is oriented to the different EU and national objectives, such as energy efficiency, sustainability, digitalisation, and security, among other things.

It is important to consider that the advancement of the upskilling system would first and foremost consider the national objectives and the needs of the Lithuanian public (clients, users and the public interest). This will require rallying the resources and efforts of all business, research, and governmental institutions involved in the sector of construction. It is equally important that this system continues to be developed as an environment grounded on goals, responsibilities, trust, and cooperation, one that is balanced and based on governmental regulation and national and international standards, methods of good practices, and the principles of market self-regulation.

Part one of the project included a thorough status quo analysis (SQA) of the themes pertaining to the advancement of the upskilling system in the Lithuanian construction sector. Part two produced a Roadmap for upskilling in the construction sector of Lithuania up to 2030 (this document), based on the assessment of the information summed up in the SQA, with teams of experts from the market participants engaging in a number of working sessions.

The status quo analysis and the drafting of the Roadmap saw the involvement of representatives of various business, research, and governmental companies and bodies involved in the construction sector. The Roadmap was produced in 5 iterations, with market participants involved in its production presenting summarised interim results and continuing to crystallise the key elements and solutions of the plan. The resultant concept and structure of the Roadmap as well as the draft action plan, complete with its integration in the real-life practice of governmental procurement, were presented to a broader public at the conference of “Sustainability of Public Procurement in Construction. Competences and Their Assessment. BuildUpSkillsLT2030”. Market participants are called upon to approve of the action plan formulated in the Roadmap and to contribute to its implementation.

For the action plan to be actively used and implemented, it is critical that it is disseminated to the maximum extent possible even after the completion of the project, with maximum level of engagement of the different market participants involved. To that end, the plan is to continue Roadmap and action plan presentations in different forms (such as at conferences, during trainings, at events, on social media, and elsewhere). The available Roadmap and the module for the monitoring of the action plan will be uploaded to a public webpage, broadly presented to market participants, with further approvals to be collected from major national governmental bodies and business entities involved in the construction sector, such as client organisations, social partners, businesses, associations and alliances, public bodies, bodies of professional self-government, institutions of tertiary education and teaching, vocational training, and other concerned parties, so that it can make an actual contribution by the construction sector into the achievement of the national strategic goals.

The goals of the BUILD UP Skills – LITHUANIA 2030 initiative and the methodology for the development of the Roadmap

Launched in 2011, the BUILD UP Skills initiative is geared towards boosting the qualifications of building specialists across Europe, enabling them to engage in the construction and maintenance of near-zero buildings in the light of the ever-increasing EU and national goals in the area of energy efficiency and sustainability.

The methodology of BuildUpSkillsLT2030 activities and organisation has been chosen with an aim of overhauling and creating a dynamic and inclusive umbrella network of stakeholders in the sector of construction of Lithuania that would rally all the stakeholders from business, research, and governmental institutions and be open to everyone who agrees with the shared objectives and the available action plan (Roadmap).

The updated status quo analysis and the national Roadmap for upskilling in the construction sector up to 2020 has been produced in the light of the ever-changing demands for the qualifications and competences in the construction sector and the constant emergence of increasingly ambitious goals (Fig. 1).

The project is being implemented by the Lithuanian Builders' Association as its administrator, working in association with partners: The Construction Sector Development Agency, a public body; Vilnius Gediminas Technical University; Kaunas University of Technology; The Regional Centre for Innovation Management and Digital Construction, non profit organization.

The posts of running the three work groups based on the lifecycle phase have been assigned to top-tier professionals representing the associated structures. The helm of the planning and design phase (S1-S4) of group one has been given to the director of the National Passive Home Association. The management of the construction phase (S5) of group two has been assigned to the head of the Upskilling Department at the Lithuanian Construction Association (LSA). And the director of the National Electrical Equipment Business Association (NETA) has been tasked with the oversight of the building operation and maintenance phase (S7) of group three.

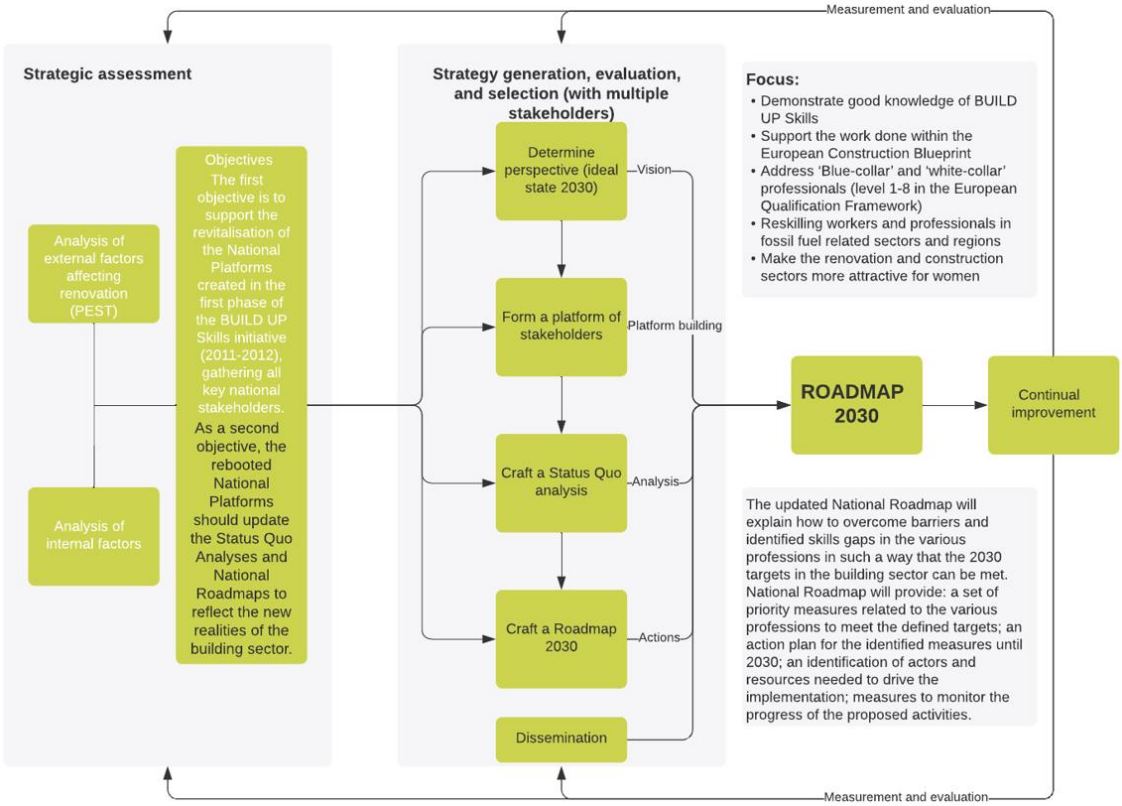


Fig. 1. Methodological Diagram of the Development of the Roadmap and the Action Plan

1. Summary

We already have a functioning system for planning goals, implementation of planning and design activities, organising and managing the activities of different phases of construction, quality control, upskilling and assessment in the construction sector of Lithuania. The process of drafting this Roadmap included a review of the measures have been established and are currently being implemented on the market by governmental, business, and research organisations, as identified in the SQA, and integration of suggestions on how they can be overhauled, optimised, or expanded, as appropriate, against the goals set forth for new periods (up to 2030 and 2050) on an EU and national level, in the action plan.

An assessment of the current situation and the insights from the market participants on the teams producing the Roadmap has led to the identification of the main bottlenecks and challenges in relation to the development of the system of future competences of the construction sector:

- **All things considered, in the context of the building lifecycle (BLC), there is an absence of a structured stance on the integration of the phase of building operation and maintenance in the overall process of planning, design, construction, manufacturing, operation, and supervision, and on the importance of this phase within the whole lifecycle.** In this context, it is critical to consider the fact that the phases of design and construction cost account for about 1–5% of the total lifecycle of a building, while the phase of operation and maintenance, for about 95–99% of the entire BLC.
- **Right now, the implementation of sustainability-related measures on the market is rather fragmented.** Market participants diverge in their understanding of what sustainability is. Considering the aspect of sustainability of construction in the lifecycle of a building, CO2, the amount of waste generated, and other sustainability aspects, as well as the last aspect of demolition, disposal, recycling, and reuse of the building lifecycle, the phase of operation and maintenance of buildings is a key stage of the BLC, which must first and foremost serve as baseline data for the purposes of formulating goals and requirements for the phases of design and construction, and then take over and effectively manage all of the outcomes of the construction process.
- **The output and efficiency of the construction sector is still far behind the Lithuanian and the EU average.** Lithuania has been hosting various initiatives in the area of digitalisation of the construction sector on the topics of designing and implementing and integrating different solutions in the areas of operation, OpenBIM, GIS, and other fields of the digitalisation of the sector, both nationally and through integration into international networks at the initiative of business organisations for more than 10 years now. Since 2015, governmental bodies have also been actively engaged in the activities of developing digitalisation solutions for the sector and have taken the first regulatory steps in that direction. However, there is still a huge gap between business and governmental initiatives and models under development in this critically important field. Efforts to rally and integrate the pending measures and resources and to integrate into international networks involved in developing digital solutions should therefore continue.
- **In the area of regulation of the construction sector, we have a model that is fragmented across different ministries and agencies and is oriented towards the formation of minimum (mandatory) requirements as well as their implementation on the market and control.** Currently, the government is focused, through different ministries and agencies. exclusively on the state-level regulation of activities of the construction sector that have a bearing on the society and the public sector, with market participants invited only to attend consultations of different levels and forms. This makes it difficult to coordinate the fields of activities among the different ministries based on the fields of representation for the purposes of shaping various measures, such as in the areas of construction, environmental

protection, education and science, business incentivisation, social security, and so on. Some measures overlap and building and implementing joint integrated measures lack possibilities and competences. This has evidence in the attempt to implement the criteria of economic efficiency and green procurement on the market with no integration or state-level recognition of the various self-regulation models and tools already available or currently under development on the market. This process has been stalling on the market for nearly 10 years now. This kind of model does not guarantee quicker and more efficient implementation of newly formulated objectives on the market, does not promote any processes of continuous and timely response and learning of market participants, and does not promote innovation, among other things. In this context, the state is still underutilising cooperation with different associated non-profit organisations representing various fields in the construction sectors, such as associations, alliances, bodies of professional self-government, public bodies, to name a few. It merits to take a close look at some of the activities pertaining to the public interest that governmental institutions and bodies are currently engaged in, and to appraise the possibility to hand over some areas to the self-regulation of business, with the government taking part in these activities by validating, supporting, and utilising their outcomes.

- **We do not have any mechanisms for structured development and implementation of integrated demonstration projects.** The government makes a lot of investments into promoting innovation by individual businesses and clusters thereof, product development, and an array of other measures. As a case in point, measures for the development and promotion of demonstration projects are currently only available in relation to the development, testing, and promotion of wood panel technologies for modernisation projects. Instruments of developing demonstration projects should expand into the rest of the priority areas of the construction sector and the related projects, without limiting the participation of organisations in project implementation to a particular type of organisation. Joint teams of business, research, and governmental organisations or purchasing organisations of any appropriate composition, as well as companies and associations or public bodies should be enabled and encouraged to design and implement all sorts of demonstration projects.
- **Some professions in the area of developing competences in the construction sector are missing standards.** The working on this Roadmap, its producers have established that we have a slew of professional standards pertaining to upskilling on the market (in the sectors of construction and architecture), yet the available standards do not include any professional standards for electricians and building operation and maintenance specialists.
- **The available curricula do not cover all professions in the sector relating to the themes of energy efficiency, sustainability, and digitalisation.** The lifecycle of buildings does not cover (lacks) structured trainings of building operation and maintenance specialists of all levels that would be integrated into/aligned with the themes of training design and construction specialists, considering the overall objectives set for the construction sector.
- **There is a pronounced shortage of an integrated interdisciplinary stance on the market not only among different professions within the scope of a particular phase, but also with regard to developing interdisciplinary character, integrated knowledge, and skills within the professions and competences of different construction phases**.
- **Lithuania offers no structured incentives for adults to develop their general and specialist competences.**

The following action plan of this Roadmap envisions structured solutions to bottlenecks and problems that have been identified.

2. Introduction

In this section, the information collected and summarized in the scope of the current situation analysis (SQA) activities is intended to argue the scope of the objectives, structure and content of the action plan further formed in this document.

The section below provides brief insights into key indicators of the building construction sector, links to national policy and existing VET regulations and self-regulation, various quantitative data related to the construction sector, such as: number of companies and employees, energy consumption and target indicators, 2030 energy (efficiency improvement, installation of renewable sources, etc.) goals and the planned contribution of the construction sector, etc.

This chapter also provides a brief summary of the BUILD UP skills initiative at national level 2012-2022. progress made during the period.

2.1. Key Indicators of Construction Sector

The construction sector is one of the most important parts of the Lithuanian economy, accounting for €4.7 billion in 2022 - 7.03% of the country's GDP. One job in the construction sector is associated with 3-4 other jobs in other sectors[1]. The main indicators of the construction sector and their trends are presented in Table 2.1

Table 2.1. Dynamics of the key indicators of the construction sector

YEAR	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Share of the construction sector in the national economy										
LT GDP (billion EUR)	35.0	36.6	37.3	38.9	42.3	45.5	48.9	49.8	56.2	67.49
Construction work carried out within the country (billion EUR)	2.1	2.4	2.5	2.3	2.6	3.0	3.4	3.3	3.6	4.7
% of GDP	6.00	6.56	6.70	5.91	6.15	6.59	6.95	6.63	6.41	7.03
Construction work carried out abroad (billion EUR)	-	-	0.200	0.230	0.280	0.310	0.390	0.396	0.449	0.590
Enterprises in the construction sector										
Number of construction enterprises (units)[2]	-	-	6,987	7,315	7,749	8,029	8,778	9,362	9,675	10,714

[1] *Order of the Minister of Environment of the Republic of Lithuania. 2015. Guidelines for the Expansion and Development of the Lithuanian Construction Sector in 2015-2020* (TAR, 2015-11-10, Nr. 17869)

[2] *Official Statistics Portal. 2023*. Database of Indicators.

Employees in the construction sector										
Number of employees (total in country) (thousands)	1,296	1,323	1,341	1,372	1,362	1,380	1,388	1,367	1,383	1,453
Number of people employed in the construction sector (thousands) [3]	89.38	99.07	105.43	103.97	100.32	103.50	106.93	101.64	104.94	119.89
Of which women (thousands)	-	-	-	-	12.9	13.0	12.8	15.9	16.8	15.3
% of employees in the construction sector	-	-	-	-	12.86	12.6	11.57	15.64	16.01	12.77
Average gross salary in the construction sector (EUR/month)	-	-	714	774	840	924	1296	1378	1620	1808
Labor productivity in Lithuania (Gross value added per person employed) - thousand euro [4]	36.3	32.9	27.8	30.2	34.2	37.0	35.6	39.2	-	-
Labor productivity in the construction sector (Gross value added per person employed) - thousand euro	11.4	13.1	13.0	13.6	14.4	16.2	17.4	18.2	-	-

Note: Some of the comparable statistical information of the Lithuanian construction sector is only available for periods from 2015 onwards, because that was the year when part of the framework for the grouping of data compiled at a national level was altered. In this table, the statistical data for the construction sector from EUROSTAT and the Official Statistics Portal are presented under section F of the Classification of Economic Activities (ERVK) v2: Construction, which covers the activities of all types of entities and contractors involved in all spheres.

The construction sector is closely connected to other areas: mining and quarry operation, processing, the supply of electricity, gas, steam, and air conditioning, the supply of water, wastewater processing, waste management and regeneration, transportation and warehousing, information and communications, real estate transactions, professional, scientific, and technological activities including the activities of building design, architecture, constructional computations, geological surveys, and various other construction engineering activities and services). The classification of activities could cause some irregularities in presenting data on the number of persons employed in the construction sector.

According to Table 2.1 and the SQA analysis, the Lithuanian construction sector is characterised by the following trends:

- **The Lithuanian construction sector is characterised by an upward trend in the number of enterprises**, with an increase of more than 50% since 2015. The growth in the

[3] *Eurostat. 2023. Data Browser*: Employment by A*10 industry breakdowns.
[4] *Eurostat. 2023. Data Browser*: Apparent labour productivity by NACE Rev. 2.

number of enterprises has been influenced by the trend towards smaller enterprises, the emergence of new areas in the construction and energy industries (e.g. renewable energy, etc.), the development of new technologies, the increase in productivity, and the various initiatives and incentives for the development of small and medium-sized enterprises.

- **The number of employees in the Lithuanian construction sector is also on a general upward trend**, with 104 940 employees in 2022 (7.22% of total employment).
- The total **number of identified employees working in enterprises related to the design, construction and maintenance of buildings** amounts to **54 904**, of which **37 022** workers and **17 882** professionals. This figure does not include self-employed natural persons.
- **The number of female workers in the construction sector is decreasing**, reaching 12.7% in 2022.
- **Labour productivity in the sector is still low** at 69% of the EU average, but it is on the rise, increasing by 60% between 2013 and 2020.
- **More than half of those employed in construction are skilled workers and craftsmen**, although their share has been declining for several years. There is no shortage of unskilled workers in the market.
- The Lithuanian construction sector is characterised by the fact that **around 40% of the workforce will retire by 2030**, and it is therefore necessary to provide for measures to educate and attract the younger generation to engineering education programmes at different levels (from vocational training to colleges and universities).
- **Lithuania's construction sector is moving rapidly towards the digitalisation of the construction sector**. Since 2014, Digital Construction organization has been organising various activities at national level in Lithuania. Decisions to promote digitisation have also been launched at government level. As of 2022, part of public sector design and construction procurement is already subject to mandatory BIM development requirements using OpenBIM principles.
- Lithuania's construction sector still has a low circularity index. The recycling and recovery rate of construction and demolition waste in Lithuania is 79.5%, compared to over 90% in other countries.
- In Lithuania, various measures are aimed at introducing public procurement practices using cost-effectiveness criteria. However, due to the lowest price public procurement practice, which has been entrenched in the market for more than 20 years and is still widely used, and the complexity of the public procurement mechanism, the current public procurement practice does not motivate and encourage either the public or the private sector to invest in sustainability and quality, as the system of cost-effectiveness criteria has not yet been developed and tested. This automatically has negative consequences for investment in the competence development system for professionals and workers. Lowest price procurement discourages investment in higher levels of professional and corporate competences.

2.2. Key indicators for the Building sector

According to the data available in the Real Property Register (RPR)[5], there are 588,475 (of them – 558,9 are 1-2 apartment buildings and 41,6 multi-apartment apartment buildings), 18,884 mixed-function buildings, 188,668 non-residential buildings, 1,772,958 auxiliary buildings (garages, storage sheds, etc.), and 58,069 garden buildings registered in Lithuania at this time (January 2023). Non-residential and residential buildings dominate in terms of floor area. All of these quantities have the potential to be renovated, rebuilt or upgraded in the future. The total volume of building construction is on an upward trend. The total volume of building construction has an upward trend.

In 2021, energy consumption in Lithuania amounted to 66.59 TWh per year, of which about 40% (~27 TWh) was consumed in buildings. Newly constructed buildings have to comply with the

[5] *State Enterprise Centre of Registers. 2023. Open data in the Real Property Register: Registered objects - Buildings.*

requirements for nearly zero energy buildings[6] (NZEBs), i.e., the energy performance class must be A++. The distribution of buildings by both energy performance class and area is shown in Figure 2.1[7]. Among the currently certified A++ buildings, 82% are residential buildings with 1-2 flats. In certified A++ class buildings, air-source heat pumps are the dominant heat source (80.6%).

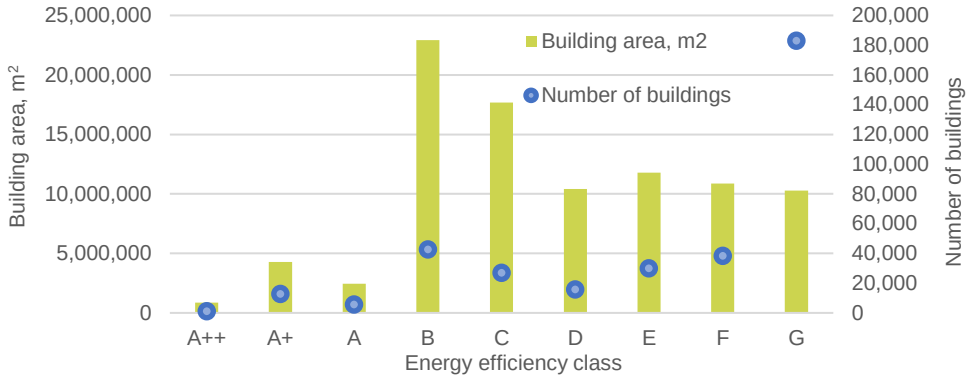


Figure 2.1: *Number of certificates issued and building area*

The biggest problem in the building sector in Lithuania is caused by old, unmodernised apartment blocks, of which there are currently more than 41,000, dominated by multi-apartment buildings built according to the pre-1993 technical norms for construction. Of the total number of apartment blocks registered in the residential building stock, 77% are below energy class D and consume almost half (47%) of the total primary energy of the building stock.

Renewable energy sources accounted for 28.10% of total final energy consumption in Lithuania in 2021 (including 48.62% of final energy consumption for heating and cooling and 20.92% of total electricity consumption). Thus, in the buildings sector as a whole, RES account for 25% of final energy consumption. In reality, the share of RES in the balance of energy consumption in buildings is much higher, as the thermal energy consumption in buildings (31%) corresponds to the amount of heat supplied and consumed in buildings through district heating. The Lithuanian district heating sector is characterised by a particularly high share of heat produced from RES. In 2021, as much as 67.3% of heat in district heating was produced from RES. Almost all of this renewable energy was produced from the combustion of solid biofuels (wood and wood waste). The number of prosumers (generating consumers) in Lithuania is also growing at a very high rate. In 2015, a scheme for generating consumers was established, resulting in a breakthrough in the solar electricity generation sector, with the total installed capacity of prosumers increasing from 146.947 MW to 430.753 MW between 2021 and February 2023.

Two main statements can be made to summarise the energy consumption trends in the national building sector: 1) Lithuania is rapidly increasing the use of renewable energy sources in the building sector; 2) energy efficiency is still a problem, mainly due to inefficient old apartment blocks that require renovation.

[6] *Ministry of Environment of the Republic of Lithuania. STR 2.01.02:2016 "Design and Certification of Energy Performance of Buildings"*

[7] *Construction Sector Development Agency (SSVA). 2023. Building Energy Performance Certification Register.*

2.3. National policy targets for the 2030

Common strategic objectives for energy and climate change

Lithuania has prepared the National Energy and Climate Change Action Plan of the Republic of Lithuania 2021–2030 [8] (hereafter referred to as the NECS Plan), in accordance with the requirements set out in Regulation (EU) 2018/1999 of the European Parliament and of the Council of 11 December 2018 on the Governance of the Energy Union and Climate Action. The NECS Plan has been prepared based on and integrating the provisions of Lithuanian national legislation, international commitments, strategies and other strategic documents, as well as the objectives, targets and measures that are under the implementation of that are planned to be implemented[9]. The NECS Plan integrates the policy elements of energy and climate change management through 5 interlinked policy dimensions, of which two are most closely linked to the construction sector: 1) reduction of dependence on fossil fuels - deployment of renewable energy sources and 2) energy efficiency.

The NECS Plan describes the existing policies adopted to achieve the objectives in these areas and proposes additional packages of planned policies to ensure that the national objectives are fully met. A draft update of the NECS Plan is currently being prepared and is due for adoption by 30 June 2024.[10]

The NECS Plan sets out binding targets for Lithuania at the national and EU level to contribute to the agreed EU 2030 energy and climate change targets (Table 2.2). Lithuania's leadership in climate change mitigation goes beyond mandatory EU-wide targets.

Table 2.2. Lithuania's key energy and climate change targets in the updated NECS Plan

Objectives	**EU target**	**Lithuania**	**Current situation**
	2030 m.		**2021 m.**
GHG reduction targets compared to 1990	≥ -55 %	**≥-70 %** (*former EU target ≥-40%*)*	-58 %
Share of renewables in total final consumption	42.5 %	**55 %** (*45 %*)*	28.1 %
Energy efficiency targets:	-11.7 %		
Primary Energy Consumption (PEC) Final Energy Consumption (FEC) Final energy savings	992.5 Mtne 763 Mtne	PEC – 5.2 Mtne (*PEC – 5.4 Mtne*)* FEC – 4.2 Mtne (*FEC – 4.5 Mtne*)* 39.3 TWh	PEC – 6.6 Mtne FEC – 5.7 Mtne

**based on the current version of the NECS Plan.*

[8] *Ministry of Environment of the Republic of Lithuania. 2019. National Energy and Climate Change Action Plan of the Republic of Lithuania 2021-2030.*

[9] *Lithuanian Energy Agency*

[10] *The National Energy and Climate Action Plan of the Republic of Lithuania 2021-2030 (coming update).*

Energy efficiency targets for the building's sector

Lithuania has identified priority areas for energy efficiency to achieve the 2030 targets, one of which is to promote the comprehensive renovation of multi-apartment residential and public buildings (with priority given to the renovation of residential neighborhoods) and to achieve energy savings of between 10 and 11 TWh by 2030.[11]

As the building sector consumes a large share of the final energy, Lithuania is making huge efforts to improve the energy performance of buildings. It is planned that:

- By 2030, around 5,000 apartment buildings, or 750,000 m^2 of buildings, will be renovated, saving around 5.5 TWh of energy.
- 5-6 TWh of energy savings are expected from the renovation of private houses (1-2 apartment residential buildings) by 2030.

The renovation of public buildings will also be a major focus. Around 5,500 buildings (5.9 million m^2) are publicly owned. In 2021 around 1.9 million m^2 of these buildings were below energy efficiency class C. Around 7,600 buildings (8.9 million m^2) are owned by municipalities[12]. The reform of the central government buildings sector is underway and the renovation of public buildings is increasing. The aim is to meet the obligation under Article 6 of the Energy Efficiency Directive to renovate 3% of the floor area of central government and municipal buildings each year, which by 2030 would amount to about 510,000 m^2 and 450,000 m^2 respectively.

Measures covering the renovation of the building sector and the integration of renewable energy sources (RES) are adopted in the Implementation Plan of the Long-Term Renovation Strategy for Buildings (Table 2.3). One of the key points of the implementation plan is the integrated neighborhood renovation. To achieve these objectives, it is envisaged to facilitate the cost-effective retrofitting of 440,000 buildings, or about 110 million m^2 of floor area, over the next three decades. The Long-Term Renovation Strategy aims to reduce the annual primary energy consumption of the building stock by 60% (up to 16.2 TWh) compared to 2020, to reduce primary energy consumption from fossil fuels (by replacing it with renewable energy) by 60%, and to reduce CO_2 emissions by 100%.

[11] *Ministry of Environment of the Republic of Lithuania*, *2022.* *Implementation plan for the long-term renovation strategy for buildings*
[12] *Government of the Republic of Lithuania, 2014.* *Programme for improving the energy efficiency of public buildings*

Table 2.3. Measures in the implementation plan for the long-term strategy for the renovation/modernisation of buildings

Title of the measure, objective and task	Responsible implementers	Implementation
1. Efficient processes (integrated planning and monitoring, integrated support package)		
1.1. To ensure the digitisation of processes and services related to the renovation/modernisation of buildings. The task includes:		
• develop and deploy radically new IT solutions for the management of multi-family housing renovation/modernisation projects to ensure process quality and efficiency;	APVA	2023-2025
• modification of the renewal/upgrade information system (development or adoption of a methodology for building life cycle modelling);	APVA	2022-2025
• develop and deploy a Building Data Bank for collecting, storing, and processing data on the building stock to be renovated/upgraded.	SSVA	2024-2025
1.2. To review the renovation business model		
• encouraging project administrators to pursue the implementation of renovation/modernisation projects of multi-apartment buildings of a higher energy efficiency class and to develop innovative projects by creating a favourable regulatory environment	APVA	2022-2025
1.3. To require local authorities to prepare neighborhood comprehensive renovation programmes, giving local authorities tools to achieve this goal		
• to facilitate and implement pilot projects on the complex neighborhood renovation model and to refine the complex neighborhood renovation model on the basis of the pilots	AM, APVA	2023 -2025
1.4. The objective is to ensure the renovation of public buildings, with 3% of central government and municipal buildings renovated each year		
• renovate public buildings owned by central government and municipalities, introducing energy efficiency measures and reducing maintenance costs, and presenting the good practices and benefits of renovation to the public.	EM, AM	2022-2030
2. New technologies		
2.1. To increase the rate of renovation/modernisation of buildings using standardised modular structures made of organic materials		
• to ensure the implementation of pilot projects for the renovation/modernisation of buildings using standardised modular structures made of organic materials and to develop recommendations for the mass application of these solutions on the basis of pilots	APVA	2022-2025

Title of the measure, objective and task	Responsible implementers	Implementation
• to encourage, through support measures, the deployment in Lithuania of standardised production capacities of modular structures made of organic materials needed to meet the objectives of the Long Term Renovation Strategy	AM	2023-2024
2.2. Digitisation (use of BIM in design and construction, manufacturing) in the renovation/modernisation of buildings (2022-2025, no responsible institution is specified).		
2.3. Prepare and adopt a standard to ensure the quality, accessibility and transparency of renovation/modernization procedures (responsible – AM, timeframe not specified)		
3. Ensuring adequate competences and capacities of the actors involved in the renovation/modernisation process		
3.2. To strengthen the competences of designers (architects) and contractors (clients) (administrators, communities, joint ventures, administrators of modernisation/renovation projects) and other actors involved in the process		
• promote the organisation of architectural design competitions to select the best architectural design ideas in the context of renovation/modernisation processes	AM, APVA	2023-2030
4. Funding / Incentives		
4.1. To develop new financing models and/or instruments for the renovation/modernisation of buildings, attracting funds from private investors (responsible: AM, timeframe unspecified)		
4.2. To promote the use of renewable energy sources and limit the use of fossil fuel installations (responsible: AM and EM, timeframe unspecified)		
• in the renovation of residential and non-residential buildings to ensure that the intensity of support is at least as high as that provided to other prosumers	AM	2022-2030
• financial and regulatory incentives for the building manager to install solar PV on the roof or façade of a building	AM	2022-2030
4.3. To enable one-stop-shop financing of complex neighbourhood renovation measures		
• to enable cost-effective partial renovation, by amending legislation to define the modalities and level of public support	AM	2022-2024
5. Transitioning the energy sector towards decarbonised energy		
5.1. To ensure the transformation of the electricity sector to make all electricity supplied in buildings CO_2 neutral (responsible: EM, 2022-2050)		
• when renovating multi-apartment and non-residential buildings not connected to district heating, assess the appropriateness of their connection to district heating and/or ensure the installation of electricity, heat and/or cooling production facilities that produce energy from renewable sources	AM	2023-2030

Title of the measure, objective and task	Responsible implementers	Implementation
5.2. To ensure the transformation of the district heating sector that all heat supplied in buildings is CO_2 neutral and to achieve a share of RES in district heating systems of 90% in 2030 and 100% in 2050 (responsible: EM, 2022-2050).		
• implementing the transition of district heating networks to 4th generation, developing integrated district heating and cooling systems, making efficient use of residual and environmental energy saving measures, and introducing lower temperature modes and technologies	EM	2022-2029
• modernise control and monitoring systems for district heating networks, heat, and hot water metering devices	EM	2022-2029
• promote the use of RES in district heating (biomass fuels, solar technologies, heat pumps (waste and geothermal energy) and/or heat storage).	EM	2022-2029
5.4. To ensure that all energy supplied to buildings is CO_2 neutral through the transformation of the natural gas sector.		
• encourage owners of one- and two-family dwellings to replace old and inefficient energy generation equipment with efficient and clean heat generation technologies using RES energy for heat production	EM	2022-2030
• encouraging owners of one- and two-family dwellings to use the most efficient and environmentally friendly heat generation technologies, using RES energy for heat production	EM	2023-2030
• implementing visual communication for residential individual buildings on the basis of an interactive map	LEA	2022-2024
6. Effective communication		
6.1. To implement communication campaigns, and ensure clear, smooth, coordinated, timely communication (responsible: APVA, 2022-2029)		
7. Robust implementation system		
7.1. To review the Lithuanian construction supervision system and, on the basis of the results of this review, to create legal and/or administrative conditions for improving the system (responsible: AM, 2021-2024)		

According to the current legislation STR 2.01.02:2016[13] (as of 1st of January 2014), the Programme for improving the energy efficiency of public buildings[14], buildings renovated with the support of the state or EU funds, must achieve at least energy performance class B, but recently state funding is more focused on renovating buildings to energy performance class A or higher.

In this context, problems arise with the willingness and capacity of market actors to plan and design energy efficiency and sustainability solutions of A or higher in renovation and retrofit projects. This

[13] *Ministry of Environment of the Republic of Lithuania.* *STR 2.01.02:2016 "Design and Certification of Energy Performance of Buildings"*

[14] *Government of the Republic of Lithuania, 2014.* *Programme for improving the energy efficiency of public buildings*

requires investment in the design and implementation of demonstration projects for residential (apartment buildings and single, semi-detached, non-residential buildings and public sector buildings).

2.4. The national policies and strategies on the digitalisation of the construction sector

Business initiatives for digitization of the construction sector in Lithuania

Responding to the needs of businesses to ensure effective control of information in construction projects and improve the efficiency and competitiveness of the sector, at the year 2012 the Lithuanian Builders Association in partnership with its colleagues from other associations has assumed national leadership in digitalising the Lithuanian construction sector. Together with business companies, science and education establishments actively engaged in the underlying activities. Governmental bodies were constantly invited to list this subject as a priority area for the development of the Lithuanian construction sector and asked to allocate the necessary resources and establish incentivisation mechanisms.

In its pursuit of this subject, the Lithuanian Builders' Association, working together with partners from other associations and a team from science and education establishments, has started promoting the development of topics relevant to the digitalisation of the Lithuanian construction sector. The key results achieved over the period of 2012 to 2023 were as follows:

- ***The first international conference titled Digital Construction 2012*** was held in Vilnius in 2012. The conference featured a presentation of the hands-on results of CUNECO CCS, the creation project on Denmark's national construction information classification system and its market applications[15]. Since then, conference Digital Construction. Vilnius has become an annual event.
- In 2014, 13 associations and unions in the Lithuanian construction sector ***established VšĮ "Skaitmeninė Statyba" (Digital Construction)*** nonprofit organization: www.skaitmeninestatyba.lt (www.digitalconstruction.lt).
- In 2015, the ***first almanac titled Digital Construction 2015 was issued***, to become an annual periodical.
- The ***first "Lithuania's Best BIM Project 2016" awards*** competition was held in 2016. A system of criteria for the evaluation of BIM projects was developed. The contest has been held annually since then. https://skaitmeninestatyba.lt/projektai/
- In 2016, the team of VšĮ "Skaitmeninė Statyba" (Digital Construction) conducted, on order from the Ministry of the Environment "***A feasibility study for the digitalisation and funding of the Lithuanian construction sector"*** and published report.[16].
- In 2016, the ***Lithuanian Standardisation Department (LSD) established a TK88 BIM Committee***, the national mirror Committee of the CEN442 Committee, to actively engage in the activities of the CEN442/WG3/TG2 work group.
- In 2017, VšĮ "Skaitmeninė Statyba" (Digital Construction) (SKST), published its ***first package concerning BIM methodology and its application*** (BIM Execution Plan (BEP), LOD, Stages of BIM Project and BIM uses, Descriptions of competences of BIM Manager, BIM Coordinator, and BIM Specialist roles). In 2018, SKST methodology was expanded to include the first version of the Exchange of Information Requirements (EIR), recommendations for the classification of information under ISO81346 standard, and a number of other BIM templates. The SKST BIM methodology templates have already been tested in various construction

[15] MOLIO
[16] the Ministry of the Environment, 2016. "Study on the digitisation of the Lithuanian construction sector and recommendations for a strategy"

design and building public procurement tenders in the public sector. The documents of the SKST BIM methodology are available at https://skaitmeninestatyba.lt/dokumentai/.

- In 2018, the first SKST ***BIM methodology training programs, BIMI, BIMII, and BIMIII, were developed***. The programs were accredited following the procedure established by the Ministry of the Environment, and the trainings were launched. By 2023, more than 500 representatives of construction market and science and education organisations have been trained under these programs.
- In 2018, the registry of competences of the Lithuanian construction sector at www.STATREG.lt was launched within the scope of the outcomes of BuildUpSkills ENERGOTRAIN, a project funded by the EU.

The Lithuanian construction sector is taking giant strides towards its digitalisation, with initials decisions to promote this digitalisation adopted at the government level. The specific governmental decisions and the related legislation are described in more detail in Section 3.3. The application of building information modelling methods and BIM-related measures on a national scale can improve the quality of the projects being implemented by the companies in the Lithuanian construction sector and help address the deficit of skilled labour. However, this will require continued efforts on the part of the government and business, as well as investments to reskill the specialists across the market, including established practitioners and new learners, and to develop the necessary ITC infrastructure.

Government initiatives for digitization of the construction sector

Until now, the field of digitalisation of the construction sector has been governed by **two resolutions from the Government of the Republic of Lithuania** and a **decree from the Minister of the Environment**.

The resolution dated 8 December 2021[17] anchors the application, effective 28 February 2022, of methods of building information modelling (BIM) for the purposes of designing, building new buildings, designing structures classified as special constructions, designing, outfitting, reconstructing low- and medium-voltage electrical grids, low- and medium-pressure gas supply pipelines, systems of communication lines and cables and cable ducts when the amount of the investment is EUR 5 million or more for buildings, or EUR 10 million for engineering structures, or EUR 5 million for city block modernisation projects. The very same resolution anchored a provision that as of 1 January 2024 and 1 January 2026 the threshold of investment requiring the application of BIM methods would be reduced as follows:

- to EUR 3 million for buildings as of 1 January 2024;
- to EUR 1.5 million for buildings as of 1 January 2026;
- to EUR 5 million for engineering structures and movable things as of 1 January 2024;
- to EUR 3 million for engineering structures and movable things as of 1 January 2026;
- to EUR 3 million for modernisation of blocks of urban territories as of 1 January 2024;
- to EUR 1.5 million for modernisation of blocks of urban territories as of 1 January 2026.

On top of that, the resolution from the Government of the Republic of Lithuania dated 8 December 2021[18] authorises the Ministry of the Environment of the Republic of Lithuania to approve the procedure of criteria for the application of building information modelling methods, and on 24 February 2022, the Minister of the Environment put these criteria into law[19], anchoring the client information requirements. The client information requirements set forth the client's requirements for the project of a building being implemented through building information modelling. The client information requirements prescribe the specific measurable technical, organisational, management requirements

[17] *Resolution of the Government of the Republic of Lithuania*. 2021. Requirements and/or criteria for mandatory application of building information modelling methods (TAR, 2021-12-14, No. 25772).
[18] *Resolution of the Government of the Republic of Lithuania*. 2021. Implementation of the Law of the Republic of Lithuania on Public Procurement and the Law of the Republic of Lithuania on Procurement by Procuring Entities in the Field of Water Management, Energy, Transport or Postal Services (TAR, 2021-12-14, No. 25773).
[19] *Order of the Minister of Environment of the Republic of Lithuania*. 2022. Customer Information Requirements (TAR, 2022-02-24, No. 3543).

for the information content and process of building information modelling. The contents of the client information requirements depend on the type and scope of the building project, the client's requirements regarding the extent and contents of the application of building information modelling technologies and methodologies in the building project, the application of the expected outcomes of the building project during the different stages of the building lifecycle.

The contents relating to the application of BIM methodology that cover the drafting of normative BIM documents and BIM procurement methodological documents, the devising of the methodology for the assessment and monitoring of the benefits offered by BIM, and the preparation of the national construction information classification are created within the framework of project No 10.1.1-ESFA-V-912-01-0029 Development of Measures to Improve the Effectiveness of Life-cycle Processes for Buildings in the Public Sector through the Application of Building Information Modelling (the 'BIM-LT Project')[20]. The project is funded with moneys earmarked for *Efficient Public Administration*, priority axis 10 of measure No 0.1.1-ESFA-V-912 *Promoting National Reforms and Improving the Activities of Public Administration Bodies* under the Operational Programme for EU Structural Funds Investments for 2014–2020. The runtime period of the BIM-LT Project is between 10 January 2019 and 31 August 2023.

2.5. Existing Situation in the Field of Education and Training in the Construction Sector

In Lithuania, 34 vocational schools and 10 higher education institutions provide construction-related studies. The network of vocational schools is spread evenly across the country, while higher education institutions are concentrated in the country's largest cities - Vilnius, Kaunas and Klaipėda.

According to the Lithuanian Education Concept, vocational training institutions teach construction specialists at levels 1-5 of the Lithuanian Qualifications Framework (LQF), while higher education institutions train specialists at levels 5-7 of the LQF through a specific training/study programme.

Formal and non-formal vocational training programmes are designed to provide relevant competences in accordance with the relevant sectoral Professional Standard.

Higher education study programmes are developed on the basis of a relevant description of the fields of studies. Formal training institutions not only provide the desired competences, but also formal qualifications, which are often necessary for the pursuit of activities in certain construction sectors. Statistics on the number of graduates from formal training in a given year are collected at national level by individual fields of learning/studies and learning/studies programmes, and in many cases differentiated by physical sex. Graduates of formal education programmes tend to have the most up-to-date competences relevant to the construction sector, but the share of workers entering the construction sector (including building maintenance) with up-to-date competences would be no more than 3.5%, assuming that all graduates will be employed in a specialised occupation. This indicator suggests that the focus should be on upgrading the competences of the existing workforce, which can be done through non-formal education.

Non-formal education is most often used to complement and update existing competences in response to changing market needs. Non-formal education can also be provided by formal education institutions, training providers and enterprises whose main activity is not training, but rather the production/trading of certain construction products, software development/distribution. Competences acquired through non-formal education or time spent on learning are not systematically monitored at national level due to the lack of a common and comprehensive information system.

[20] *Ministry of Environment of the Republic of Lithuania.* 2019. The 'BIM-LT Project' (project No 10.1.1-ESFA-V-912-01-0029 Development of Measures to Improve the Effectiveness of Life-cycle Processes for Buildings in the Public Sector through the Application of Building Information Modelling).

2.6. Competences and Skills Gaps Between the Current Situation and the Future Needs

The total number of workers involved in the construction and maintenance of buildings is around 55,000, with a projected annual growth of +0.6% until 2030. The highest growth rates are projected for BIM specialists (+7.67% for LQF level 6-7 practitioners), engineering systems specialists (+5.99% for LQF level 6-7 and +2.17% for LQF level 2-4 specialists), and structural engineers (+3.41% for LQF level 6-7). In the absence of precise statistics on the age distribution of all professionals working in the sector, it is assumed that the career span of professionals at LQF level 6-8 is between 25 and 65 years, with 2.5% of professionals entering the market each year and the same number leaving, and that the career span of employees at LQF level 2-5 is between 20 and 65 years, with a change of 2.2% each year.

Given the projected need for professionals in certain narrower areas, the 2030 targets set out the quantification of the roadmap measures related to ensuring a sufficient supply of skilled workers, which are presented in Table 2.4 "Quantification of the roadmap targets related to ensuring the supply of skilled workers, their profiles and their training needs".

This table also shows the projected quantities of additional workers to be trained in order to update their competences in order to achieve the 2030 targets in the construction sector. The proportion of professionals who will upgrade their skills is based on an assessment of the proportion of certified construction professionals, with certain assumptions: approximately 2 300 people are certified/upgraded each year (with at least 20 academic hours of training), while according to the SODRA data, the size of the sector is around 18 000 people, i.e. however, given the fact that the construction sector is embracing the concepts of sustainability, digitalisation, it is estimated that at least 70% of the sector's professionals at LTQS level 6-8 will upgrade their competences within 5 years. The relatively high level of upgrading intensity amongst LQF level 6-8 professionals is most likely due to the mandatory nature of upgrading, and in the absence of mandatory upgrading amongst LQF level 2-5 professionals, the project experts estimate that it would only be 10% over 5 years, assuming a minimum of 20 academic hours of training per 5 years.

Table 2.4. Quantification of the roadmap targets related to ensuring the supply of skilled workers, their profiles and their training needs

Target	Objective	2023 situation	Data source	Forecast for* 2030	Commitment (KPI)
To ensure sufficient numbers of skilled (in identified priority areas) professionals (LQF level 6-8) and blue-collar workers (LQF level 2-5) in the building construction value chain by 2030	Total number of professionals in the building value chain (LQF level 2-8)	54904	SODRA*	57200	-
	Architects-designers (LQF level 6-8)	1606/1313	SODRA*/ Chamber of Architects	1606	at least 40 new persons per year
	Engineers: construction works (LQF level 6-8)	13536/10402	SODRA*/ SSVA***	14143	at least 425 new persons per year

	Engineers: electric works** (LQF level 6-8)	1263/2850	SODRA */ SSVA ***	1263	
	Engineers: heating, ventilation, heat generation, water supply, sewerage** works (LQF level 6-8)	1477/3500	SODRA*/ SSVA***	1628	
	Workers – construction works (LQF level 2-5)	27390	SODRA*	28012	at least 616 new persons per year
	Workers – electricity works** (LQF level 2-5)	6257	SODRA*	6660	at least 147 new persons per year
	Workers: heating, ventilation, heat generation, water supply, sewerage** works (LQF level 2-5)	3375	SODRA*	3888	at least 86 new persons per year
To ensure continuous training and adaptation to innovation and requirements of skilled (in identified priority areas) professionals (LQF level 6-8) and blue-collar workers (LQF level 2-5) working in the building construction value chain	Total number of professionals in the building value chain (LQF level 2-8)	54904	SODRA*	57200	at least 3381 renewals of competences per year
	Architects-designers (LQF level 6-8)	1606/1313	SODRA*/ Chamber of Architects	1606	at least 225 renewals of competences per year
	Engineers: construction works (LQF level 6-8)	13536/10402	SODRA*/ SSVA***	14143	at least 1980 renewals of competences per year
	Engineers: electric works** (LQF level 6-8)	1263/2850	SODRA*/ SSVA***	1263	at least 177 renewals of competences per year
	Engineers: heating, ventilation, heat generation, water supply, sewerage** works (LQF level 6-8)	1477/3500	SODRA*/ SSVA***	1628	at least 228 renewals of competences per year
	Workers – construction works (LQF level 2-5)	27390	SODRA*	28012	at least 560 renewals of

					competences per year
	Workers – electricity works** (LQF level 2-5)	6257	SODRA*	6660	at least 133 renewals of competences per year
	Workers: heating, ventilation, heat generation, water supply, sewerage** works (LQF level 2-5)	3375	SODRA*	3888	at least 78 renewals of competences per year
	Number of new qualifications required by 2030	1 additional qualification proposed - Expert in sustainability assessment of buildings			
	Number of additional trainers needed by 2030	The number of teachers/lecturers is sufficient - only the relevant competences need to be added			
Increase women's participation in the construction sector	Percentage of women working in the construction sector	16,53 %	According to the data of the Lithuanian Statistical Department in 2021	at least 20 %	-
Increase youth participation in the construction sector	Percentage of young people (15-24) working in the construction sector	6,88 %	Based on CEDEFOP labour market data	at least 7,5 %	-

*filters applied to SODRA data, assumptions and interpretation of the CEDEFOP forecast are described in the SQA analysis document
**it is assumed that specialists in these fields are also involved in the planning and deployment of renewable energy systems related to the relevant field
***SSVA data provided as a supplementary data indicate the number of certified building professionals, but the persons indicated are not necessarily active and are not recorded in the SODRA datasets

The total number of hours of training per year to achieve the 2030 Sustainable Construction Goals should amount to 128120 academic hours, with a focus on competences in recycling and reuse of materials (circular construction), and competences in digitisation of the construction process. It is appropriate to combine contact and online learning in the planning of the upskilling guidelines, as a large part of the construction market, due to the constraints of the COVID-19 pandemic, practised online learning and accepts it as efficient and convenient in terms of both time and training costs. However, the contact method should not be abandoned altogether due to the more effective involvement in the training process and the increased sharing of good practices among the participants. It is appropriate to plan for the provision of certain competences for which training experience is already concentrated in the private sector, using the potential of the private sector, although the existing infrastructure in the public sector is seen as sufficient.

The main obstacles to achieving the objectives of sustainable development of the construction sector are related to the situation of continuing education in Lithuania and the age distribution of construction

sector participants. In the construction sector, fewer people than the national average participate in training courses. As most of the construction market players foresee a need for BIM specialists, it is relevant to assess the labour market's skills to the use of specific software. This characteristic is not only very important for Building Information Modelling (BIM) competences, but also for competences in Life Cycle Analysis (LCA) of the building and its components and the general digitalisation of the construction process. Looking at the 2021 European Union statistics in this area, it is noticeable that a relatively small proportion of workers in the construction and energy sector have competences in the use of specific software. According to CEDEFOP, only 6% of construction workers and 2% of energy workers indicate that they are able to use specific software, compared with 14% to 15% of workers in similar sectors such as manufacturing, transport and warehousing.

The development of digital competences in small enterprises with low profitability is halted by relatively expensive computer equipment, while the development of competences is halted by a public procurement system based on the lowest price, which is oriented towards price rather than quality.

Another barrier to upskilling is the forecasted age distribution of the work labour - according to CEDEFOP general data, it is forecasted for Lithuania to have a rapid growth in the 65+ age worki labour group (+6.0%, while the overall labour market will shrink by -0.9%), and it is this age group that may need to spend the most money and time on the acquisition of relevant competences, as this is the age group with the longest time distance from their formal education period.

In the Lithuanian construction sector, labour productivity is still below the EU average and, given the competitive environment and the shortage of workers, this may be an additional obstacle for companies to send workers for training.

Lithuania is also witnessing a decreasing popularity of engineering studies, which means that the number of people entering the construction labour market with new and relevant competences is also decreasing.

The lack of information on the competences available in the construction sector also halts the monitoring of competency development: there is no database that would allow real-time assessment of competency development and corrective actions to achieve the planned objectives. A summary of the forecast of the shortage of specialists from the SQA analysis is presented in Table 2.5.

Table 2.5. Forecast of specialist deficit based on the survey of different groups of construction market participants.

Role	Forecasting the lack of need for specialists in the general sample of respondents			
	100-75 %	74-50 %	49-25 %	24-0 %
Customer		Construction project manager Construction engineer	BIM information manager BIM manager Maintenance manager Cost estimator Asset management engineer	Architect
Designers		BIM coordinator	Heating, ventilation and air conditioning engineer BIM modeler Project manager BIM manager Structural engineer Engineer Architect	Electrical engineer Environmental protection engineer Technologist Cost estimator Soil mechanics engineer Interior architect

Contractors		Construction manager Manager of special construction works	Construction project manager BIM coordinator Cost estimator BIM modeler Construction engineer Heating, ventilation and air conditioning engineer Electrical engineer Structural engineer	Environmental protection engineer Construction supervisor Geodesy engineer Technologist Logistics specialist (manager)
Building maintenance		Heating, ventilation and air conditioning specialist BIM information manager Electrical engineer BIM modeller	Asset exploitation engineer Maintenance engineer Engineer	Asset management engineer Cost estimator Technologist
Experts			Expertise manager of the project part Sustainability certification expert Building expertise manager Project expertise manager Expertise manager of the building part	Expert in building energy efficiency certification
Researchers	Building construction surveyor, Building engineering systems surveyor	BIM modeller	Measurement engineer Survey engineer (or specialist) of cultural heritage buildings Engineering geologist Environmental engineer (or specialist) Hygienic survey engineer (or specialist) Archaeological survey engineer (or specialist)	Geodesy engineer Landscape surveyor (architect)
Manufacturers, suppliers		Engineer	BIM modeler Technologist Construction materials technologist Sales manager	Consultant Manager

From the described survey results it can be concluded that although the overall forecasts for the construction sector have a downward trend, market participants predict an increased demand for a variety of BIM specialists, building engineering systems specialists, which is likely to be driven by the general EU and Lithuanian policies related to the reduction of fossil fuel use, the digitalisation of the construction sector, and the development of e-mobility.

2.7. Progress of the previous roadmap (period 2012-2022)

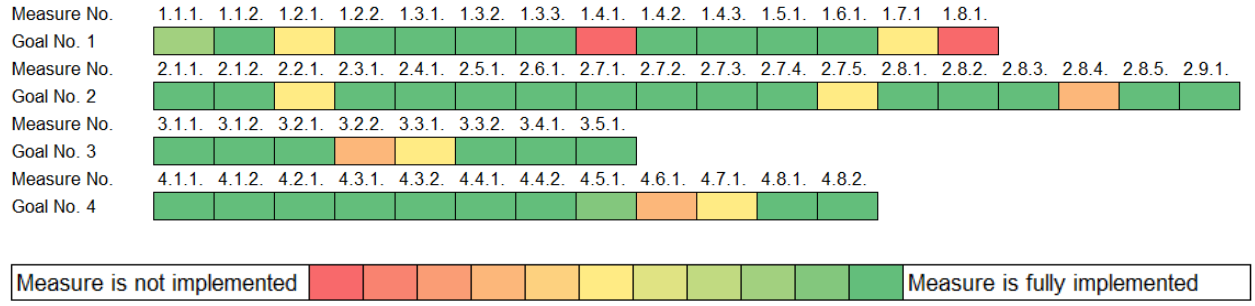
In 2013, the BuildUpSkills-LT project developed the ""“Roadmap for Training Workforce in Lithuanian

Construction Sector in Energy efficiency and renewables to Meet Energy Efficiency Targets 2020", which sets out 4 strategic goals and individual measures to achieve each of these objectives. The

evaluation of the effectiveness of these measures was carried out in 2017 as part of the monitoring of the implementation of the strategic goals of the roadmap. The BuildUpSkillsLT2030 project is also assessing the effectiveness of the proposed measures in analysing the situation of the construction sector and related areas in 2022. Summarising the objectives and measures for the implementation of the priority measures of the roadmap, it is noted that most of the tasks are related with the dissemination of information, increasing its publicity, the accessibility of the information and the clear and understandable content of information, with the largest number of 18 activities being devoted to this area. Other areas with a fairly high and even number of activities (8 each) include the preparation of new documents (legislation, rules), initiatives to ensure the quality of education, and the promotion of direct investment in training and infrastructure.

A summary assessment of progress of the 2013 year roadmap objectives and measures is presented in Figure 2.1.

Figure 2.1. pav. Progress of the 2013 year roadmap implementation in the 2022 – info-graph



The activities related to the definition of payment guidelines and broader state regulation of qualification requirements did not reach the planned physical indicators within the scope of the IV objective. It is appropriate to form measures that would ensure stable and continuous financing of competence development

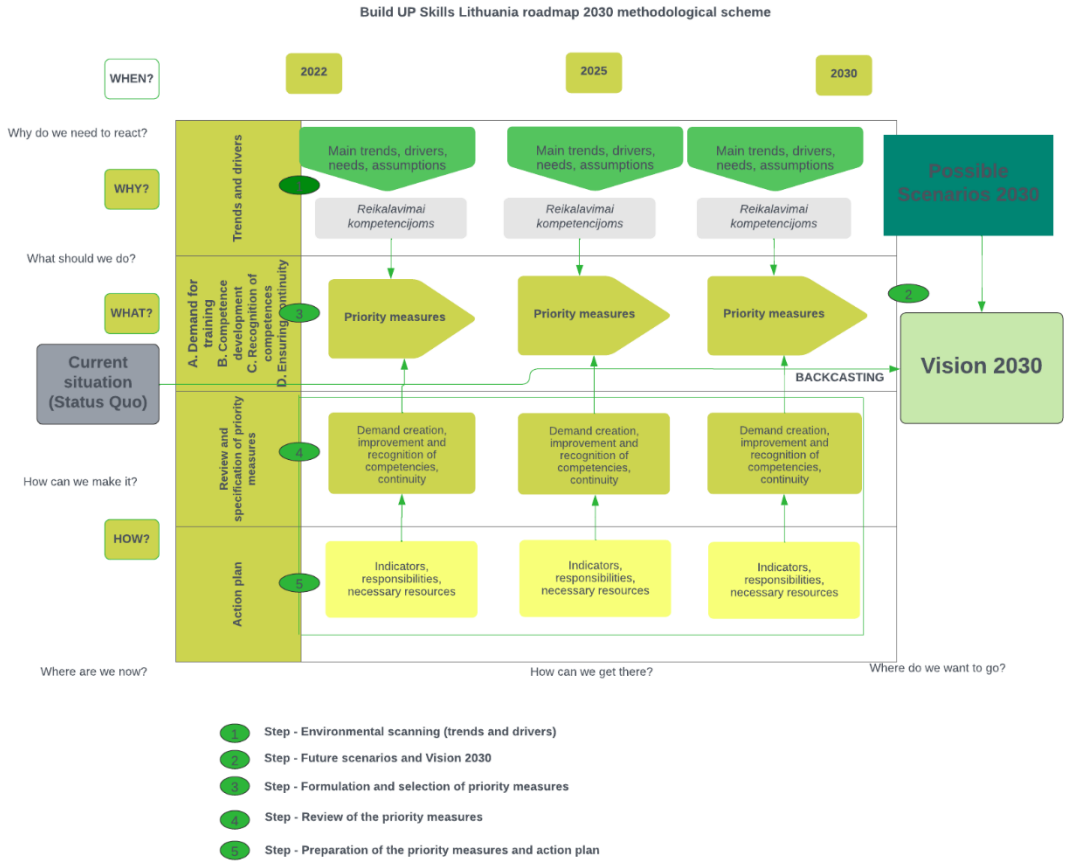
Measures that were delayed in the previous period but remain relevant in the new period:

- Measures under strategic goal No. 1, which aimed at setting higher requirements for public buildings, social housing or energy monitoring of these buildings, have not been fully implemented. This requires a funding of demonstration projects.
- Strategic goal No. 2 did not succeed in introducing at national level a centralised theoretical knowledge testing system, in drawing up the descriptions of the missing professions, and in developing closer cooperation between vocational and higher education through projects to improve the quality of studies. The STATREG system developed in the previous period should be validated at national level and extended to other areas of competence development in the construction sector.
- Activities related to the definition of salary guidelines and the broader national regulation of qualification requirements did not achieve the physical indicators planned for strategic goal No. 3. It is appropriate to develop measures to ensure stable and continuous funding for competence development.

2.8. Methodology for preparing a roadmap

In accordance with the best roadmap preparation methodological practices (e.g. Kerr, C and Phaal, R (2021) Roadmapping and Roadmaps: Definition and Underpinning Concepts. IEEE Transactions on Engineering Management. ISSN 0018-9391), the experience of previous BUILD UP Skills projects and roadmap, RIVC and its partners developed a new 5-stage methodology with descriptions of seminar agendas, responsibilities and the division of tasks between the chairs of expert groups and the facilitator, descriptions of instructions for conducting workshops, including the methods used.

The developed methodology with instructions and the results *of the analysis of the Status Quo* served as a starting point for the development of a roadmap and an action plan. In order to make the dialogue process more efficient and to achieve a greater consensus-building effect, 3 thematic expert groups on construction topics were set up, taking into account the scope of the project.[21] The specific objectives and tasks set out in the guiding process with specific topics for discussion, which were used as a method for collecting structured opinions from the stakeholders involved, performed the function of monitoring the intermediate results of the structured dialogue and acted as a tool for the practical tasks (expert meetings) for the preparation of the roadmap. The principle diagram of the methodology for the preparation of the roadmap is presented in Figure 2.2.



2.2 Figure. Roadmap methodology schema

The Roadmap preparation process included the following steps:

1. **Identification of trends and factors and assessment of their impact** – the main task was to identify the most important trends and factors influencing the need for future skills in the construction and related sectors and to prioritise them according to the criteria of probability and impact, using the methods of environmental scanning, PESTEL, nominal group techniques.[22] The main result of this stage is the plausibility and impact matrix.
2. **Development of Future Scenarios and Vision 2030** - based on the selection of the most probable and most impactful trends, axes of change were formulated[23] and on the basis of

[21] Saritas, O. (2007). Participation in Technology Foresight: Using Expert and Stakeholder Panels. *Preprint*.

[22] Franz Liebl, Jan Oliver Schwarz, Normality of the future: Trend diagnosis for strategic foresight, Futures, Volume 42, Issue 4, 2010, Pages 313-327, ISSN 0016-3287

[23] Susan A. van 't Klooster, Marjolein B.A. van Asselt, Practising the scenario-axes technique, Futures, Volume 38, Issue 1, 2006, Pages 15-30, ISSN 0016-3287

them future scenarios related to sustainable development and digital skills were developed using the method of normative scenario.[24] All future scenarios developed were assessed on the basis of desirability and feasibility criteria. Each thematic group of experts formulated and selected the most desirable and feasible scenarios, on the basis of which an overarching vision for the improvement of the competences of the sector 2030 was formulated.

3. **Formulation and selection of priority measures** - taking into account the selected scenarios in 2030, priority areas of development of demand for training, development and recognition of competencies, ensuring continuity, taking into account different professions and the needs of the sector, were proposed using the "back casting" method.[25]
4. **Review and specification of the measures** - the proposed measures, their content, have been considered and discussed in detail.
5. **Development of priority measures and action plan** – a detailed action plan has been proposed, including deadlines, SMART indicators, resources and responsibility for the implementation of priority measures.

The roadmap's three thematic expert groups were formed on the basis of the building life cycle, covering the following main stages: (1) planning and design, (2) construction, and (3) use and maintenance of the building (Figure 2.3).

Stages	PLANNING		DESIGN			CONSTRUCTION		USAGE
Phases	INITIATION	INVESTIGATION		DEVELOPMENT		IMPLEMENTATION		USAGE
Stages	Definition of needs	Definition requirements	Design proposals (Concept)	Technical Design	Detailed design	Construction	Completion of construction	Use and Maintenance
id	S0	S1	S2	S3	S4	S5	S6	S7

Figure 2.3. The building life cycle: stages, phases

Source: Project No. 10.1.1 -ESFA – V -912 -01 -0029 "Development of measures to increase the efficiency of life-cycle processes of public sector buildings using building information modelling " (BIM -LT project) [1], [1] https://statyba40.lt/wp-content/uploads/2023/10/10-WP1-statinio-gyvavimo-ciklo-procesai-ir-veiklos-modelis_2023-09-25_PROJEKTAS.pdf

The expert groups began their work in the first month after the completion of the analysis phase of the Status Quo. These three thematic groups of experts met five times (Figure 2.4). Before each meeting of the expert group, the preparatory work was carried out by the chairs of the expert groups together with the team of project partners in accordance with the methodological steps and recommendations provided by RIVC experts. After each meeting, the group leaders discussed the results of the meeting discussions with RIVC experts and the project team, processed the information collected and prepared information for the next meetings and the preparation of the roadmap. In order to verify the intermediate results of the roadmap process, online surveys were organised.

Figure 2.4. Schedule of meetings of expert groups

[24] Sardesai, S., Stute, M., Kamphues, J. (2021). A Methodology for Future Scenario Planning. In: Fornasiero, R., Sardesai, S., Barros, A.C., Matopoulos, A. (eds) Next Generation Supply Chains. Lecture Notes in Management and Industrial Engineering. Springer, Cham. https://doi.org/10.1007/978-3-030-63505-3_2

[25] Bibri, S.E. Backcasting in futures studies: a synthesized scholarly and planning approach to strategic smart sustainable city development. Eur J Futures Res 6, 13 (2018). https://doi.org/10.1186/s40309-018-0142-z

3. Upskilling scenarios for different phases of the building lifecycle 2030

In the course of drafting the Roadmap, different teams from three groups met on five occasions to discuss and identify the main areas of technological development, market development trends, and upskilling scenarios. Follows a summary of the working group outcomes.

All teams were given the tasks to model future scenarios, goals, and measures, first and foremost, within the scope of the phases of the building lifecycle represented by each group (S1-S7), also assessing the connection to and the needs for upskilling in relation to the phases of the building lifecycle represented by other groups.

3.1. Planning and design phase upskilling scenario 2030 (S1-S4)

SCENARIO OF CHOICE: VERY SUSTAINABLE, VERY EFFECTIVE

Technology and trends

The dominant aspects of this scenario are:

- Sustainability principles, with CO2 neutrality, renewable energy, and sustainable construction materials as the key elements of this scenario.
- Robotisation, digitalisation, big data, BIM (building information modelling).
- Artificial intelligence (AI).

Regulations on energy efficiency and safety apply rigidly, and sustainability managers, engineers, and project leads are responsible for the enforcement thereof. Some of the responsibilities are being moved into the sphere of self-regulation, and criteria of economic performance are gaining increasingly broad hands-on application.

Continuous training and progress

The system is designed to promote continuous training and progress across the LTKS levels. Free specialist trainings and tax cuts encourage the implementation of sustainability solutions. Prior education and work experience are recognised through mechanisms of credit awards and tests. Lifelong learning is encouraged through continuous trainings, seminars, and workplace education.

Challenges

Fast technological development can result in a learning gap, shortage of funds and resources for sustainability initiatives, and opposition to change and innovation.

Solutions

Create a continuously upgradable learning platform to enable specialists to quickly adapt to new technologies, engage the private sector and the government in the funding of sustainability initiatives, promote cultural changes through to the integration of sustainability values into organisational culture.

Future outlook 2030

- The construction sector will be transformed completely, with sustainability principles dominating.
- Robotisation and digitalisation, coupled with BIM and AI, will pave a path for the efficient management of big data and ensure effectiveness of construction processes.

- Sustainability managers and engineers will be highly skilled, and the education system will be adapted to ensure continuous learning and progress.
- Tax cuts and free trainings will drive innovation in the field of sustainability.
- Construction unicorn success stories will provide inspiration and serve as a role-model for other organisations.

3.2. Construction phase upskilling scenario (S5-S6)

SCENARIO OF CHOICE: DIGITALISATION OF CONSTRUCTION AND BIM APPLICATION

Technology and Trends

The dominant aspects of this scenario are:

- Top-level sustainability and energy efficiency requirements, enforced through regulation and incentivisation.
- One of the scenario's top priorities is the CO2 neutrality of buildings under construction, the use of renewable energy by the building and in the process of construction, and sustainable construction products.
- Building information modelling (BIM) and process digitalisation.
- Digitalisation, use of help tools, devices, instruments, and technologies, BIM integration into construction processes helps boosting the efficiency of construction processes and achieving better results with smaller workforce.
- Use of tools, devices, and instruments based on the Internet of Things (IoT) and artificial intelligence (AI).
- Development of multidisciplinarity.

Continuous training and progress

The system should be designed to promote continuous learning, upskilling, and development of new skills of specialists at LTKS levels 3 to 8.

This can be achieved with modular upskilling trainings, which will allow employees to improve their skills according to the needs of the employer or those of their own. Upskilling can also be harmonised with the assessment and recognition of knowledge and skills informally acquired.

Challenges and solutions

The main challenges are the shortage of skilled specialists and the costs of integration of new technologies. These can be addressed by reskilling the available specialists, promoting vocational training, investing into training curricula and technologies, possibly with training delivered in the process of reskilling. Another important thing is to promote inter-sectoral cooperation to achieve shared (inter-sectoral) qualifications and skills.

Future outlook 2030

- Construction processes will be automated, and integration of artificial intelligence and robotics will facilitate the management and supervision of construction projects.
- BIM will become tool number one in ensuring high-quality design, construction, and maintenance.
- The Internet of Things will enable real-time monitoring and analysis of data, thus optimising the use of resources and minimising waste.
- Construction projects will be focused on sustainability, and energy efficiency and environmental regulations will become tighter.

- Buildings will be designed and built to minimise environmental pollution and to use as little energy as possible.
- Vocational training programmes will be adapted to new technology and methodology.
- Soft skills such as creativity, critical thinking, and cooperation will become critical for every employee.
- Continuous learning and progress will become a prerequisite for career advancement.
- In 2030, the Lithuanian construction sector will be revolutionary, sustainable, and competitive.
- Technology, innovation, and skilled specialists will allow this sector to grow and expand, and the principles of sustainability will ensure that construction projects will be delivered with environmental and social requirements in mind.

3.3. Building operation and maintenance phase upskilling scenario 2030 (S7)

SCENARIO OF CHOICE: DYNAMIC PROGRESS

Technology and Trends

The dominant aspects of this scenario are:

- Sustainability, energy efficiency, and safety goals and requirements are the key aspects of this scenario, requiring continuous learning and adaptation.
- Integration and dynamic regulation of high technology aligned with aid mechanisms designed to achieve higher levels of energy efficiency, sustainability, and effectiveness.
- Fundamental technology and trends include artificial intelligence (AI), the Internet of Things (IoT), building information modelling (BIM), high-level data analytics, and engineering system integration.
- Development of multidisciplinarity.

Continuous training and progress

The system should be designed so as to promote continuous training and progress across the LTKS levels. This can be achieved through continuous specialist upskilling, revision of curricula in the light of technological advancement, and informal upskilling. Prior training and work experience should be recognised and persons available on the labour market should be encouraged towards lifelong improvement of knowledge and skills.

Challenges and solutions

One of the main challenges is the opposition of senior employees to technological innovation. This can be addressed by establishing motivational systems, ensuring continuous upskilling, and updating the legal base to provide for smoother deployment of new technology. Governmental bodies and business should actively cooperate towards the development of clear qualification and training standards, revision of legal regulations, and assurance that business is able to take full advantage of digital technology.

Future outlook 2030

- This scenario calls for active cooperation between the government and business, for the government must change/adapt the legal base to technological advancement and create a clear system of qualification competence supervision and training.
- Under this dynamic development scenario, the construction sector in 2030 will be very much influenced by state-of-the-art technology and dynamic rules of the market.
- Employees of all levels will have to adapt to the technologies of high-level building management systems (BMS), data analytics, and the Internet of Things (IoT).

- Older employees will have to overcome their opposition to digital innovation through continuous learning and flexible upskilling programmes.
- The legal system will have to change and adapt to seamlessly integrate technological advancement. A lot of attention will be paid to informal upskilling, continuous improvement of professional qualifications, and revision of curricula to bring them in line with the level of technological advancement.
- Cooperation between the government and business is key, with the government adapting the legal systems to the continuous and dynamic technological advancement and designing an integrated, self-regulatory system for teaching and rating competences in coordination with business.
- Business will have to be able to take full advantage of digital technology to ensure the efficiency and profitability of construction, modernisation, and maintenance activities.
- The market will demand better-skilled employees who are able to use technology to achieve higher levels of efficiency and sustainability, which will significantly boost the competitiveness of the construction sector and drive exports to foreign markets.

4. A vision for improving competences in the Lithuanian construction sector till 2030

The teams of the 3 groups of the Roadmap development also had the objectives to formulate a vision for the development of competences in the Lithuanian construction sector and to clarify the strategic directions of development. The results of the working groups are summarised below.

A vision for competence development in the Lithuanian construction sector: **'Creating a sustainable, digitally transformed and European-competitive construction ecosystem'**.

In 2030, the Lithuanian construction sector embodies a harmonious combination of sustainability, technological innovation and skilled craftsmanship, cultivated at all stages and in all areas, throughout the entire building life cycle. Every existing or new building, structure and space is a testament to a future where human ingenuity, artificial intelligence and environmental consciousness come together to create living and working environments that are not only functional and aesthetically pleasing, but also echo the principles of sustainability.

The formulation and implementation of this Roadmap aims to form a solid basis for the **LITHUANIA'S VISION FOR THE FUTURE "LITHUANIA 2050" "Lithuania on the Road: the State where I want to live and create", adopted by the Government in December 2023. A country I want to protect**".

By implementing the Roadmap, we aim for the construction sector to make a significant contribution to the sustainable development of Lithuania as a mature democracy, a country inhabited by educated, healthy and community-minded people, a country that produces and exports world-class knowledge and innovation, and a country where the territory of the country is being developed in a sustainable and balanced way.

Strategic orientations for the development of competences in the sector

1. Sustainability

- Implement strict energy efficiency and environmental safety rules.
- Promote innovation in sustainable materials and practices.
- Promote CO2 neutrality in every construction project.

2. **Technology and innovation**
    - Accelerate the integration of BIM, IoT, IoT and other digital technologies into construction processes.
    - Promote a culture of innovation and technology adoption.
    - Develop infrastructure to integrate cutting-edge technologies.
3. **Workforce development**
    - Develop lifelong learning systems, integrating formal, non-formal and informal learning pathways.
    - Develop modular and adaptable curricula in line with technological and environmental trends.
    - Promote a culture of creativity, innovation and adaptability among staff.
    - Expand the scope for interdisciplinarity in training programmes in order to broaden the understanding of the needs of adjacent occupational fields and to allow for more flexible retraining as required.
4. **Cooperation and partnership**
    - Strengthen public-private partnerships to promote innovation and standards.
    - Promote international cooperation through the exchange of knowledge, technology and best practice.
    - Implement policies to facilitate smooth cooperation and innovation. Enable the design and implementation of demonstration projects of different scales and compositions.
5. **Regulatory applicability**
    - Develop dynamic legal systems that adapt to technological progress. Promote the principles of self-regulation through the active involvement of non-profit business associates.
    - Implement policies that promote innovation, safety and environmental protection.
    - Strengthen regulatory mechanisms to enable rapid and effective policy adaptation and implementation.
    - Further develop and market a set of rational cost-effectiveness criteria for the procurement of services and works in the construction sector, together with public sector organisations and business.

5. A strategy for planning and implementing projects to ensure the efficiency of the BLC

From the results of the SQA analysis and all the meetings of the Roadmap Working Groups, a clear direction for the systematic development and market deployment of **project management competences in the construction sector using OpenBIM methodology and technology** was clearly identified and shaped. The consistent introduction of this as a strategic initiative for construction project management in the market will lead to a fundamental change in the quality of projects in the construction sector and will enable the systematic achievement of the long-term goals set at national level.

The need to strengthen the coordination of the further development, deployment, training and competency assessment of this methodology at national level, combining the resources and activities of the public sector, business associations and research and training organisations, was also clearly identified. In Lithuania, these activities have already been actively organised for more than 10 years on the initiative of business associations. The State has also been actively involved in digitisation activities in the sector in recent years.

In order to achieve the set objectives, it is appropriate to further develop and implement together the unified methodology of the VšĮ Digital Construction (SKST) in the market, while continuously improving

it. It is also important to further develop the SKST methodology, to test and integrate the results of the public sector BIM LT 2023 project and of other projects developed by other market players on topics of common interest to the whole sector.

The **SKST methodology**, in the **Lithuanian Construction Sector Competence Development 2030 model**, **becomes the basis** for the integration of the efforts of all construction actors from client requirements to the implementation of objectives, through the development and work of Integrated Construction Life Cycle (ICLC) project teams.

Below is the principle structure of the SKST BIM project implementation methodology using OpenBIM principles in the life cycle of structures/buildings and the competence development of the Lithuanian construction sector (Figure 5.1). The initial scheme is developed within the scope of the EU H2020 BIMPlement project.

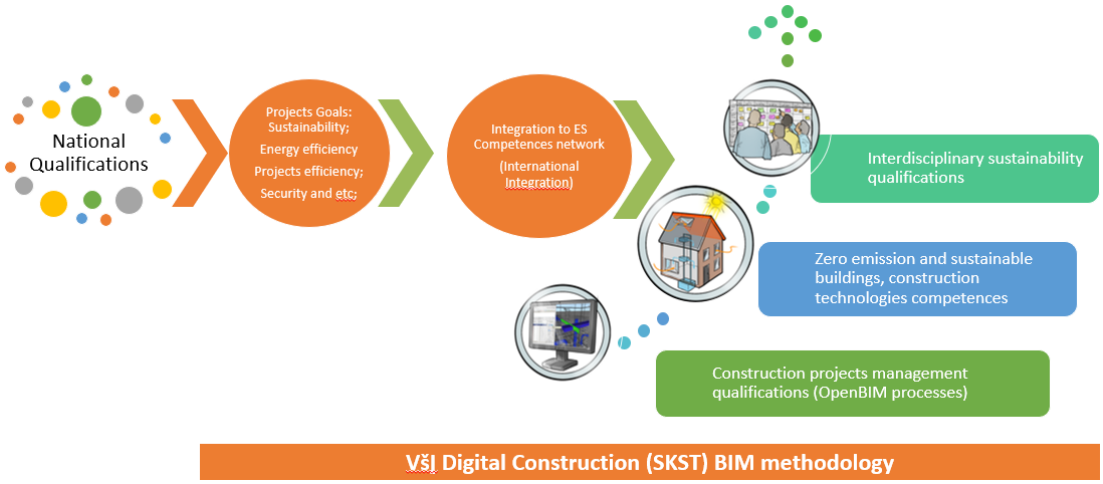


Fig 5.1. *Principle diagram of OpenBIM competence development for construction projects in BLC.*

5.1. Objectives for construction projects

One of the key components of the Lithuanian construction sector's continuous competence development system model is the alignment of the objectives for the planning and implementation of construction projects and the relationship between the market players and the national long-term goals for the sector by 2030.

It is further important to integrate the agreed objectives into the scope of the minimum mandatory requirements for the procurement of construction services and works in the public and private sectors, and to integrate them into the methodology for the formulation and evaluation of cost-effectiveness criteria. The parameters for specific indicators and values should be harmonised and published on a platform agreed by market participants and integrated into the structure of the EIR templates for the exchange of information requirements for BIM projects.

By formulating these objectives for the BLC of projects, we aim at a complete transformation of the sector's competence development, focusing on the development of a highly skilled workforce focused on the formulated national objectives, the integration of advanced technologies, and the enhancement of sustainability, energy efficiency and safety.

This step will also enable the sector as a whole to gradually shift from the current focus on projects that are mostly implemented according to the minimum requirements of the regulations or other

legislation, and usually at the lowest cost, to the search for and implementation of rational technological solutions that go beyond the minimum requirements in the projects.

Table 5.1 summarises the structure of the clusters of objectives and the recommended areas of application.

Table 5.1. *List of groups of objectives applicable to the planning and implementation of construction projects*

Code	Purpose group	Building structures and systems	Construction (for Processes)	Company (Qualification. Experience)	For Employees (Qualification. Experience)
T10	Quality of life	Yes	Yes	Yes	Linked to company and project results
T20	Energy efficiency	Yes	Yes	Yes	Linked to company and project results
T30	Sustainability	Yes	Yes	Yes	Linked to company and project results
T40	Efficiency of projects (time and budget)		Yes	Yes	Linked to company and project results
T50	Safety (Occupational safety, Fire safety, Security)	Yes	Yes	Yes	Linked to company and project results
T60	Cost-effectiveness (assessing design solutions, know-how and innovation of professionals and companies)	Yes	Yes	Yes	Linked to company and project results

Note: In traditional design (using conventional 2D technology), it is also strongly recommended to consider the possibility of formulating objectives for the project according to the groups of objectives shown in Table 5.1.

5.2. BIM use cases (aspects)

Further, in the development of training programmes and training content, it is important to assess which BIM use cases /aspects are linked to energy efficiency and sustainability objectives and activities. In the scope of procurement specifications, it is essential to identify the extent to which project teams will be required to develop and use BIM models (information containers) for different objectives and processes within the scope of the project.

Below is a table with the BIM applications (aspects) related to energy efficiency and sustainability activities in projects (Figure 5.2).

	Project stages	PLANNING	DESIGN			CONSTRUCTION		USAGE
	SKST project development stages	S1	S2	S3	S4	S5	S6	S7
	BIM Use Cases	PROJECT PROGRAM	CONCEPTUAL DESIGN	DESIGN	DETAIL DESIGN	CONSTRUCTION	COMPLETION OF CONSTRUCTION	USE AND MAINTENANCE
1	Economic/quantity and cost estimation	S1.1	S2.1	S3.1	S4.1	S5.1	S6.1	S7.1
2	Modeling of existing conditions	S1.2	S2.2	S3.2	S4.2	S5.2	S6.2	S7.2
3	Planning project stages	S1.3	S2.3	S3.3	S4.3	S5.3	S6.3	S7.3
4	Plot analysis	S1.4	S2.4	S3.4	S4.4	S5.4	S6.4	S7.4
5	Functional, volumetric, planned assessment	S1.5	S2.5	S3.5	S4.5	S5.5	S6.5	S7.5
6	Project visualization and previews	S1.6	S2.6	S3.6	S4.6	S5.6	S6.6	S7.6
7	Design / Modeling	S1.7	S2.7	S3.7	S4.7	S5.7	S6.7	S7.7
9	Energy analysis	S1.9	S2.9	S3.9	S4.9	S5.9	S6.9	S7.9
10	Sustainability assessment	S1.10	S2.10	S3.10	S4.10	S5.10	S6.10	S7.10
11	Structural analysis and design	S1.11	S2.11	S3.11	S4.11	S5.11	S6.11	S7.11
12	Lighting analysis	S1.12	S2.12	S3.12	S4.12	S5.12	S6.12	S7.12
13	Analysis of engineering systems	S1.13	S2.13	S3.13	S4.13	S5.13	S6.13	S7.13
14	Other analysis cases (e.g. evacuation and work safety planning, etc.)	S1.14	S2.14	S3.14	S4.14	S5.14	S6.14	S7.14
15	Conformity assessment / project expertise	S1.15	S2.15	S3.15	S4.15	S5.15	S6.15	S7.15
16	3D coordination	S1.16	S2.16	S3.16	S4.16	S5.16	S6.16	S7.16
17	Construction site planning (construction site plan) (includes part of environmental planning)	S1.17	S2.17	S3.17	S4.17	S5.17	S6.17	S7.17
20	Construction technologies (technological diagrams) and simulation of the installation process	S1.20	S2.20	S3.20	S4.20	S5.20	S6.20	S7.20
21	Construction logistics planning	S1.21	S2.21	S3.21	S4.21	S5.21	S6.21	S7.21
23	Digital production	S1.23	S2.23	S3.23	S4.23	S5.23	S6.23	S7.23
24	Technical supervision of	S1.24	S2.24	S3.24	S4.24	S5.24	S6.24	S7.24
25	Executable model	S1.25	S2.25	S3.25	S4.25	S5.25	S6.25	S7.25
26	Data model	S1.26	S2.26	S3.26	S4.26	S5.26	S6.26	S7.26
27	Building maintenance planning	S1.27	S2.27	S3.27	S4.27	S5.27	S6.27	S7.27
29	Analysis of energy consumption	S1.29	S2.29	S3.29	S4.29	S5.29	S6.29	S7.29
30	Asset management	S1.30	S2.30	S3.30	S4.30	S5.30	S6.30	S7.30
31	Space management and monitoring	S1.31	S2.31	S3.31	S4.31	S5.31	S6.31	S7.31
32	Sustainability monitoring and analysis	S1.32	S2.32	S3.32	S4.32	S5.32	S6.32	S7.32

- Model development activities related to energy efficiency and sustainability in the project

- Energy efficiency and sustainability related processes using the developed model for various simulations, calculations and implementation

- Related business processes under the responsibility of the client according to the model developed (building permit system, maintenance, operation and maintenance processes)

Fig. 5.2. *Structure of BIM applications/aspects related to energy efficiency and sustainability objectives in SGC.*

6. The content of the themes of energy efficiency, sustainability and digitisation

The themes for future competency training highlighted by the experts in the working groups during the development of the Roadmap, and linked to the clusters of objectives formulated, are presented in Table 5.2. The table does not represent all the training topics that could be gathered from other sources and existing curricula, but only a summary of the main directions and links to the formulated goal clusters highlighted by the experts of the groups. Further organisation of the updating of professional standards and the development of training programmes should include an assessment of the review and updating of the content of the existing training, with the addition of the topics formulated in Table 5.2.

In the column on practical topics (UseCases), examples of potential sources of information for the development of training materials are given. The last column contains an example of one of the applications available on the market

Table 5.2. *Energy efficiency, sustainability and digitisation themes and their relationship to the target groups*

Code	Strategic Objective	Learning Outcomes	UseCases. Examples of best practice	Link to the NPNA training programme (example)
T10	Quality of life	Improving the comfort of quality of life. Examples of how the indicators can be broken down. LEVELS: Indoor air quality; Time spent outside thermal comfort; Lighting and visual comfort; Acoustics and noise protection. Passive House: Thermal comfort.	https://environment.ec.europa.eu/topics/circular-economy/levels_en https://passivehouse.com/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm	X
T20	Energy efficiency	Increase energy efficiency; Minimise the energy consumption of the building's passive measures (Passive Measure Energy Efficiency Technologies; Nodes; Sealing Technologies, etc.)	https://ucm.buildingsmart.org https://passivehouse.com/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm	X
		Minimise the energy consumption of the building's active measures (Heating systems; Ventilation systems; Air-conditioning systems; Automation; BMS and others)	https://ucm.buildingsmart.org https://passivehouse.com/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm	X
		Optimise natural lighting solutions and minimise energy consumption of artificial lighting	https://ucm.buildingsmart.org	X
		Increase the amount of renewable energy produced in buildings or from remote sources	https://passivehouse.com/02_informations/02_passive-house-requirements/02_passive-house-requirements.htm	
T30	Sustainability	Minimise CO2 emissions during the construction and use phases	https://ucm.buildingsmart.org	X

		Minimise waste generation during the construction, use and demolition phases of buildings	https://environment.ec.europa.eu/topics/circular-economy/levels_en	X
		Maximise the re-use of the waste generated	https://environment.ec.europa.eu/topics/circular-economy/levels_en	
		Developing competences in life cycle analysis of buildings	https://ucm.buildingsmart.org www.skaitmeninestatyba.lt	X
T40	Efficiency	Developing competences in project management	In BIM projects: www.skaitmeninestatyba.lt	X
		Developing BIM competences	www.skaitmeninestatyba.lt www.statyba40.lt	
		Developing interdisciplinarity skills within the scope of related qualifications and competences (parallel qualification)	In BIM projects: www.skaitmeninestatyba.lt	X
		Develop skills in BIG DATA analysis and the application of technology in design	In BIM projects: www.skaitmeninestatyba.lt	
		Develop skills in the application of information/data quality control technologies	In BIM projects: www.skaitmeninestatyba.lt	
		Gain knowledge and practical skills in the latest technologies on the market (e.g. Boston Dynamix robots, 3D printing, drones, etc.)		
		Develop general IT literacy competences		X
		Develop practical skills in the implementation of BIM methodology in projects (EIR, BEP, CDE, classification, naming, parameter creation and management, etc.)	www.skaitmeninestatyba.lt www.statyba40.lt	X
T50	Safety	Develop competences in the development of occupational safety solutions in a BIM environment	www.skaitmeninestatyba.lt	

		Developing fire safety solutions in a BIM environment	www.skaitmeninestatyba.lt	
		Building access control and security		
T60	Cost-effectiveness	Applying cost-effectiveness and green procurement criteria in design		
		Applying cost-effectiveness and green procurement criteria in construction		
		Applying cost-effectiveness and green procurement criteria to the use and maintenance of a building		

The table below shows the possible sets of target indicators based on the clusters of targets developed. In the purchase conditions, it is important to provide detailed descriptions of the objectives with specific measurable values for the selected objective indicators in the formulation of project requirements.

Below is an example of a description of a T10 target group with measurable outcomes.

Comfort could be determined by many highly subjective elements, even the color of the surroundings, the view from the window, the feeling of security, all of which have a unique impact on each person. However, a large part of comfort depends on thermal comfort. The measurable criteria for optimum thermal comfort could be:

- comfortable air temperature (both summer and winter), the temperature of surrounding surfaces (the temperature difference in different directions should be small, the room air temperature between the head and feet of the seated person should be less than 2 °C),
- the sensible temperature in the living room may vary by less than 0,8 °C,
- the ventilation system with heat recovery shall provide the required amount of fresh air, but the speed of air movement shall not exceed the permissible limits,
- the humidity of the air (the air should be neither too humid nor too dry).
- In addition to these comfort criteria, acoustic comfort (both between the different rooms of the building and between the interior of the building and the surrounding environment) must be mentioned.

7. Action Plan for the Implementation of Priority Measures (2024–2030)

Evaluating the above summarized information, an action plan of priority measures for the development of competences in the Lithuanian construction sector until 2030 has been formed in this chapter (Table 7.1).

The action plan was formed by grouping all measures into 4 groups.

A. **for creating market demand for competences improvement,**
B. **for formal and informal (continuous) improvement of competences,**
C. **assessment, recognition and attestation** tools,
D. **to ensure the continuity of the implementation of project measures and objectives,**

In the columns of the table, the code of the measure, the name of the measure and the indicators of the achievement of the goals (in 2030) and short justifications and descriptions of the measures are formulated under each measure, which are planned to be used as a basis for the development of project implementation of the measures, monitoring of implementation, presentation of results and linking of various information sources.

The values of all other columns of the plan table (measures implementation stages, responsible organizations, financing and others) are formed in the scope of the project and are recommended to be additionally evaluated by all participants in the construction market during implementation and to be involved in the long-term and short-term goals of each organization.

The road map and measures plan, as well as the monitoring solution, will be placed on the BuildUpSkillsLT2030 project WEB page and publicly available to all market participants. All market participants are invited to familiarize themselves with this Roadmap and choose and join the implementation activities of the Roadmap according to their areas.

Link to the website: https://statybininkai.lt/lt/projektai/buildupskillslt2030

The types of organizations that can implement the measures are used in the measures plan table:

- State institutions (Ministries; Agencies; Inspections)
- Municipalities and municipalities companies
- Builders (public and private sector)
- Procuring organizations
- Associations (Business associations and professional unions)
- Designers
- Contractors
- Building Maintenance Companies
- Experts
- Researchers
- Manufacturers
- Suppliers
- Scientific and educational organizations (Universities, colleges) and Institutes
- Vocational training institutions
- Non-formal education providers

Abbreviations for names of specific organizations are used in the table:

- AM - Ministry of Environment of the Republic of Lithuania
- APVA - Environmental Project Management Agency of the Ministry of the Environment of the Republic of Lithuania

- EIMIN – Ministry of Economy and Innovation of the Republic of Lithuania
- EM - Ministry of Energy
- LAR - Lithuanian Chamber of Architects
- VPT - Public Procurement Agency
- KPMPC – Qualifications and Vocational Training Development Center
- LGBC - Lithuanian Green Building Council
- SKST - VšĮ Skaitmeninė statyba
- LSA - Lithuanian Construction Association
- LSIS - Lithuanian Union of Civil Engineers
- LPTVS - Lithuanian Building Sustainability Assessment System;
- SODRA - State social insurance institution under the Ministry of Social Security and Labor of the Republic of Lithuania
- SSVA - Construction Sector Development Agency
- ŠMSM - Ministry of Education, Science and Sports of the Republic of Lithuania
- SADM - Ministry of Social Security and Labor of the Republic of Lithuania
- VERT - State Energy Regulatory Office
- VDA State Data Agency

Table 7.1. Action plan for the priority measures in the area of developing competences in the construction sector of Lithuania up to 2030

1. Name of measure	2. Periods of measure implementation			3. Responsible organisations	4. Funding	5. Achievement indicators (for 2030)	6. Measure groups (legal regulation; market factors)	7. Groups of phases of building lifecycle (BLC)
	2.1 2024–2025	2.2 2026–2027	2.3 2028–2030					
A. MARKET DEMAND GENERATION								
A01. Prepare and implement a methodology for the calculation and assessment of CO_2 limit per building sq.meters values in projects.	Development and enactment of methodology	Revision and application of methodology	Revision and application of methodology	AM; APVA; Associations Colleges and institutes	EU projects and state aid	Assessment of CO2 limit values for projects envisioned in the legislation	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance;
At this time, we do not have any methodology and practice for the assessment and promotion of the implementation of sustainability solutions in projects; therefore, the suggestion is that a methodology be developed to cover the following areas: ● Identification of the requirement to apply environmental impact declarations to construction products; ● Preparation and implementation of a methodology for the calculation and assessment of CO_2 limit values. (For instance, by establishing CO_2 emission limit values in kilograms per one unit of the gross floor space area of a building (kg/m2). The development of this methodology should consider the experience of other countries and apply it in Lithuania.) ● Enactment of the requirements in the legislation.								
A02. Establish a system of subsidies to promote the construction and renovation of sustainable buildings in line with CO_2 reduction objectives.	Draft system available; Testing;	Approval; Application;	Application	Governmental bodies; Business associations;	EU and state aid or other instruments	System to promote subsidies in place (impact).	Legal regulation	Planning and design; Construction; Building operation and maintenance;

The entire plan to promote sustainability in Lithuania is grounded on a set of minimum mandatory requirements. This creates quite a few problems and even threats for investors in certain cases. All market stakeholders agree that a percentage of the subsidy based on the ultimate CO_2 reduction would have a better effect on promoting the construction of sustainable buildings and sustainable renovation.

- The proposal is to create a system of subsidies tied to the key sustainability requirements on the construction market in Lithuania.

A03. Revise and update the methodology for the renovation (modernisation) of apartment buildings, private homes, and public buildings, apply a cost benefit assessment methodology to upgrade them to energy efficiency class A or higher and achieve sustainability goals.	Revise and update legislation and programmes; Launch demonstration projects;	Evaluate demonstration project results	Revise methodology	AM; APVA; CPVA; Municipalities Business associations; Academia	Partial EU and state aid or other instruments of incentivisation	At least 50 per cent of residential buildings and at least 80 per cent of buildings in the public sector to be upgraded to energy efficiency class A or higher. At least 10 demonstration projects to be implemented;	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance;

The year 2023 saw revisions made to construction technical regulation STR 2.01.02:2016 'DESIGNING AND CERTIFICATION OF ENERGY PERFORMANCE OF BUILDINGS', which provides that renovated (modernised) buildings must have energy performance class B or higher.

Considering the current regulation, the following minimum legal requirements have been transposed into programmes for the modernisation of apartment and public buildings:

- The current program requires that modernisation of apartment buildings must achieve energy efficiency class B or higher.
- A comparable situation exists with public building modernisation projects. At this time, public building renovation projects are funded under the Programme for the Improvement of the Energy Efficiency of Public Buildings, which is used to finance projects on the improvement of the efficiency of energy consumption in public buildings that achieve energy performance class B or higher and improve the physical and energy-related qualities of buildings and their engineering systems. The program stipulates that:
    - The Energy Ministry of the Republic of Lithuania is responsible for improving the efficiency of energy consumption in public governmental buildings;
    - The Environment Ministry is responsible for improving the efficiency of energy consumption in public municipal buildings.

Considering the harmful practice of purchasing design and construction services based on the lowest cost that has taken shape over the past few years, as well as the fact that clients do not know how to apply the criteria of economic efficiency in the process of procurement, the clients tend not to take any risks to avoid potential complications with procurement. As often as not, they purchase modernisation service on the lowest-cost principle, with the minimum requirements (such as attaining energy efficiency class B) becoming the underlying objective and the outcome of building modernisation projects.

The existing measures available that allow upgrading buildings to a higher class of energy efficiency do not have a lot of traction with the clients, mainly due to the market and the society lacking readiness and knowledge to develop projects with integrated energy and economic efficiency solutions. The call to upgrade buildings to class A and higher that was published in 2023 drew little interest from the market. https://apvis.apva.lt/paskelbti_kvietimai/daugiabuciu-renovacija-a-klasei-2023-02 Achieving the ambitious goals of energy efficiency and sustainability of the EU and Lithuania, the current harmful practice needs to be changed, with the following measures implemented in the programme for the modernisation of public and residential buildings: ● We recommend revising the legal regulation so that all apartment and public buildings undergoing modernisation were subject to a cost and benefit analysis, its results providing a basis for achieving energy class A or higher. ● Promote a model or renovation (modernisation) by the block and demonstration projects. Renovation (modernisation) of buildings should aim not only to achieve a higher class of energy efficiency, but a higher level of living and aesthetic quality as well. Instead of being limited to just renovation of buildings, efforts should also be made to renovate and modernise the surroundings and courtyards of buildings and public spaces and to change their layout in line with modern needs. ● Procurement should be subject to the criteria of economic efficiency both in terms of properties, and provider competences. ● Projects that achieve energy efficiency class A or higher should qualify for larger state aid. ● Promote the modernisation of single/double apartment buildings. ● Apply the BIM methodology in public sector modernisation projects. ● Promote the application of the BIM methodology in residential projects. Note. With assets of cultural heritage, these guidelines are recommendations and not requirements.								
A04. Update construction technical regulation STR 2.01.02:2016 'Designing and Certification of Energy Performance of Buildings' to include the dynamic modelling of energy efficiency within the scope of BIM development.	Updated methodology; Dynamic energy modelling incorporated in construction technical regulation STR 2.01.02:2016 'Designing and Certification of Energy	Methodology applied in BIM projects;	Methodology applied in BIM projects; Methodology revised as necessary	AM; Academia; SSVA Associations Governmental data collection agencies	EU and state aid or other instruments	Projects that must apply BIM use dynamic energy efficiency modelling.	Market factors Legal regulation;	Planning and design; Construction; Building operation and maintenance;

	Performance of Buildings'							
The energy efficiency design methodology and programme that is currently available at www.**ssva**.lt/nrgpro and is used in the process of traditional design and construction has its calculation results diverging from the actual results post-implementation (based on the feedback from market participants). To ensure a more reliable alignment of investment and design calculations (simulations) and the actual real-life outcomes – in other words, to minimise the deviations, the following actions are suggested within the scope of this measure: ● Enact the application of the dynamic energy efficiency modelling for BIM projects. ● Envision the comparison of the dynamic modelling results with the calculations of the currently available NRGPRO in the scope of implementation. ● Revise the existing scopes of climate data to include relevant and updated data. The current climate data are dated and deviate from the actual ones by up to three degrees, largely distorting the results of the energy efficiency calculations of a building. ● Collect data of projects completed to serve as a foundation for an open database. ● Conduct an analysis of the outcomes of projects completed and revise and update the methodology as needed. ● Apply the dynamic energy efficiency modelling requirements within the scope of the EIR requirements of BIM projects in the public sector on a mandatory basis.								
A05. Open the existing databases or design new open data ecosystems for data required to satisfy the obligatory requirements of building design, construction, and operation (such as climate data, building energy performance ratios, cadastral data, and so on) **for all parties involved in the construction process**.	Open data scope identified; Publicity rules established	Identified data are readily accessible to specialists		AM; SSVA VDA Governmental data collection agencies SKST; Associations	Governmental	Data provided. Data used.	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance;
Having established the targets of and requirements for sustainability and energy efficiency and the digitalisation of the construction sector, the government collects, albeit on a fragmented basis, various statistical or normative data. These data are very relevant and instrumental for professionals for the purposes of planning and design, construction and supervision optimisation, especially when they are updated or processed on a regular basis. ● The government must make sure that the necessary data are available, readily and free of charge, to specialists so that they can achieve the established goals.								

- One of the open data sources available at the moment is the State Data Agency (SDA): https://duomenys.stat.gov.lt/atviri-duomenys/
- However, the scopes of the data required for the implementation of BIM/GIS projects need to be reviewed with the aim of assessing whether the appropriate structures are provided with the necessary data.

A06. Build an electronic register system for the general indicators of buildings, to include the requirements of EU directive No 2023/1791 on Energy Efficiency (new wording), effective as of 2023, with regard to the collection and publication of energy efficiency data [the EU analogue of e-Passport].	Building e-Passport methodology and prototype available Data collected;	Data collected and analysed;	e-Passport methodology updated as necessary	AM; SKST; SSVA; Associations; Academia;	EU and state aid or other instruments	e-Passport available on the market; Data on buildings collected; Some building data available to market participants on an open basis;	Market factors Legal regulation;	Planning and design; Construction; Building operation and maintenance;

Today, once a project is completed, its documentation is delivered to the client in the format of a PDF, DWG, WORD or another digital file or even on paper. The information so presented varies in structure and in volume, which makes it difficult to use. Therefore, the scope of intrinsic key data of all projects should be identified and the process of collecting and storing such data digitalised.

- Some of the data of a building that needs to be collected have already been described in the effective regulations. The scope of the necessary data has to be expanded in view of the existing sustainability goals and the possibilities to digitalise construction processes with the application of BIM methodologies and the development of BIM models.
- The database under development must integrate key building and monitoring data: the basic parameters of the building, as well as its energy efficiency, sustainability, effective operation, quality of life, and other criteria.
- The scope of this measure must envision the development of a National Building Energy Performance Database and its integration into other administrative (such as cadastral) databases.
- The development of the building e-Passport structure must avoid any overlaps of data.
- The scope of project implementation must evaluate the requirements of updated EU directive No 2023/1791 on Energy Efficiency (new wording) regarding the collection and publication of energy efficiency data.
- In the process of its development, the solution must be brought in line with the new OpenBIM standards and formats that have been undergoing consistent development by BuildingSMART since 1994 (such as IFC4.3; IFC5; BCF3.0; IDS; bsDD; and others), as well as the National Construction Information Classifier that is being created and developed in Lithuania.
- The methodology must apply to projects funded with EU or national moneys on a mandatory basis.

- Envision incentives (or mandatory application measures) for private builders to apply this measure.
- Use the data to evaluate the possibility to form scopes of and access to open data for the participants of the construction market.
- Projects of varying scopes on the related themes are already under development in Lithuania and other EU countries and across the activities of the BuildingSMART community, such as:
    - Presentations of smart cities with integrated BIM and GIS solutions and building data models in Helsinki and Tampere, Finland, and Rotterdam, the Netherlands, at the Digital Construction conferences by SKST;
    - One related project is the 'Building Data Bank', an ongoing project by the SSVA: https://docs.google.com/document/d/1Anvf6pU-oVbYxpt3Ot35YiwFJ7IYPW0Ifj8Kn8IHLD0/edit.
    - The related activities within the framework of the development of 3D city models of the Vilnius plan, Kaunas municipality, and other towns and cities of Lithuania.
    - There are many overlapping activities by other organisations in the area of collecting data of building operation and maintenance and the information structures of key building parameters (criteria) that we do not know about.

The efforts of all market participants must be rallied, and the international experience of BuildingSMART in the EU assessed and connected to the requirements for the development of BIM models in designing 'S6. As-built' and operation and maintenance models and to the demands for data on buildings in various registers.

A07. Enact the building digital model (BIM) **as a legitimate form of the project** for the purposes of design, construction, and building operation and maintenance regulation, **by updating STR** 1.04.04:2017 and STR 1.05.01:2017.	Update STRs; Apply;	Apply; Evaluate results;	Revise STR 1.04.04:2017 .	AM; SSVA; SKST; LSIS, LAR; Business associations;	-	100% of projects subject to mandatory BIM applications have their construction permits issued against presentation of digital model	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance;

The current construction regulation legally recognises only 2D documentation created and used in the process of conventional design and construction, which also rooted in the legislation. With BIM projects, the main source of design documentation is the geometrical BIM information container linked to parameterised data and documentation. Once the project is completed and an S6 (As-built) BIM model is available, another key source of information about the building should be the BIM information container titled the 'Digital Twin of the Building', which covers the necessary level of the geometry of the building's elements and sets of information parameters. To be able to effectively create, check, and use project information, projects that are subject to BIM requirements must:

- Enact the parity between digital BIM models and 2D documentation (specifications, explanatory notes, blueprints, and so on).
- Have the hierarchy of their documentation incorporate the term 'BIM information container (model)' (as per ISO 19650), establish the priority of the BIM model and regulate the level of detail of the model across all design and BLC phases, as well as the transfer of the model as the BLC phase shifts and the builder/owner changes.
- Have their regulation provide for informed decision making, rather than just design on the basis of the established rules and requirements.

● Raise the level of responsibility assumed independently by specialists, grounding it on expert data, calculations, expertise, certification, research by independent certified laboratories or research bodies. Optimise the legal system by enacting the principles of self-regulation of architect and engineer, envisioning rights, duties, and responsibilities. See which of the existing regulations and norms should be moved to the sphere of processing and using data collected through self-regulation. ● Identify repositories for uploading and storing BIM models (such as PlanuojuStatau), as well as the procedure of using them to obtain construction permits, conduct project expertise, carry out building maintenance, and operate the building. Within the scope of this measure, the following actions are required: ● Draft a new wording of construction technical regulation STR 1.04.04:2017 'BUILDING DESIGN, PROJECT EXPERTISE'. ● Draft a new wording of construction technical regulation STR 1.05.01:2017 'Documents Permitting Construction. Completion of Construction. Registration and Transfer of an Unfinished Building. Suspension of Construction. Dismantling the Products of Unauthorised Construction. Dismantling the Products of Construction under Illegal Documents Permitting Construction'. ● Assess which of the legislation should regulate the procedure of using and updating models transferred to phase S7 (Operation and Maintenance).								
A08. Create sets of rules for measuring compliance of BIM information containers (models) for automated project evaluation and the issuing of documents permitting construction (an equivalent of the EU ePermits initiative).	Create rules Test	Test Revise Enact	Test Revise Enact	SKST; Business associations; Research bodies; Municipalities and other purchasing organisations; AM; SSVA;	EU and state aid or other instruments	As of 2028, to apply to 100% of permits that are subject to presentation of BIM model	Market factors Legal regulation;	Planning and design

Currently, the procedure and system for performing construction project checks, expertise, and issuing documents permitting construction that is in place in Lithuania, called Infostatyba, is grounded on 2D project documentation (pdf) only. Initiatives by different European countries have already led to the completion (or pending completion) of construction projects that have their compliance to various requirements (norms, standards, regulations) measured with automated roles and BIM information containers (models) in OpenBIM formats (IFC). ● Lithuania should also develop its own module for the check-up rules and automated checks of the BIM models of construction projects, drawing on the experience of the EU states (ePermits), which would be used for the purposes of issuing documents permitting construction across all Lithuanian municipalities. ● To that end, create rules for checking the mandatory scope of OpenBIM models and their minimum content. These rules must be created in an OpenBIM format and linked to the buildingSMART bsDD (buildingSMART Data Dictionary) database. ● These rules may also be applied by experts that verify the compliance of projects to the legislation and the BIM requirements as formulated in the process of procurement, using various software applications that work with OpenBIM formats. ● Pilot project BIM models proposed to be developed for other measures should be used for the purposes of testing this process. ● The rules should be tested with at least ten BIM projects before they are approved for mandatory application. ● Provide for revisions to the content of the rules after the testing. ● Connection to the EISMEA/2022/OP/0007 project 'Support of the Digitalisation of the Built Environment, Public Procurement and SMEs in Construction. ePermits'. ● Connection to the shared EU projects launched by BuildingSMART chapters in 20 EU states. Manifesto of collaboration was signed. Related topics: ○ The 'BIM Requirements Framework Harmonization', a project proposed by Norway; ○ The 'Align Exchange Information Requirements (Minimum Requirements, at least, Some Common Uses Cases)', a project proposed by Luxembourg. ● Connection to the LIFE20 project that the APVA is implementing in association with partners from the public sector in Lithuania: https://webgate.ec.europa.eu/life/publicWebsite/project/LIFE20-IPC-LT-000002/improving-energy-efficiency-in-lithuania https://klimatokaita.lt/life-ip-enerlit								
A09. Devise, test, and approve a common integrated Building Maintenance Standard.	Rules drafted and approved. Rules tested	Deployment and training, measuring results; Enactment	Adjustments to standard as needed	EM; AM; Business associations; Research bodies; SKST	EM; VERT	Building maintenance standard approved and operational	Market factors Legal regulation;	Building operation and maintenance

At this time, we do not have a building maintenance standard. A building maintenance standard needs to be designed, approved, and launched on the market through its integration into the overall building lifecycle. Within the scope of the standard, its connection with the related design and construction processes and the requirements for the transfer from the 'As-built' phase of construction and/or BIM models (for projects where BIM requirements apply) must be assessed. ● A common integrated BUILDING maintenance standard would cover public buildings, industrial buildings, and residential apartment buildings. ● The standard will define the types of buildings and the procedure of maintenance of the building's structures and engineering systems.								
A10. Develop a system of building operation quality parameter ratings – an open evaluation system, for building users.	Develop methodology. Test and publish results	Open system in place with open rating data for public buildings	Rating results applied in design	Business associations and trade unions; Research and educational establishments; SKST	Business; EU and state aid	Functioning system with open public building data used for improving design process	Market factors Legal regulation;	Planning and design; Building operation and maintenance;
Right now, we do not have any tools on that market that would enable building operators or users to express their opinion on the quality of life and working environment. ● The building lifecycle should envision that building operators rate their buildings on the basis of the key requirements and quality of life and comfort parameters of the building. ● Designers, developers, clients, and other specialists should be able to see the ratings and the analysis of their results. ● Future owners must also be able to see the results. ● It is a simple and useful tool to improve quality and satisfy the operators' expectations on the market better. ● Offering this rating opportunity must be made mandatory for all public buildings and recommendable to private homes. There must be a possibility to share observations and good practices. ● The experience of the systems available on the market (such as booking.com, airbnb.com) should be evaluated and employed.								
A11. Initiate and implement integrated pilot (demo) projects to include sustainability, energy efficiency, renewable energy	Prepare funding programme for integrated pilot (demo) projects	Initiate and launch at least seven new pilot	Take measurements, analyse and publish results,	AM; EM; SKST;	EU and state aid	At least ten pilot (demo) projects implemented	Market factors Legal regulation;	Planning and design; Construction;

resources, digital building twins, or other themes of implementing and testing innovative technologies or processes and measuring their results.	Initiate and launch at least three new pilot (demo) projects;	(demo) projects;	prepare recommendations for implementation of good-practice projects	Business associations; Research bodies				Building operation and maintenance

We have more than 20 different state funding and aid programmes that are scattered across different fields, their administration assigned to different ministries and agencies or bodies in the public sector, with the types of organisations eligible to prepare and submit applications, such as public bodies, businesses, or research institutions, identified for each programme. There are no integrated invitations to business, research, and client teams whatsoever.It is impossible to establish the right team according to the objectives, achieving them takes different measures, which potentially complicates some of and causes overlaps in the activities, preventing business and research efforts from being merged at the sector's level.

The practice of implementing integrated projects by focusing on the objectives without any limitations as to the team composition, has been effectively applied for more than 15 years in EU funding programmes FP7, H2020, and the 2021–2027 European Horizons and NextGenerationEU programmes.

- Summing up, Lithuania should design funding programmes for various integrated demonstration projects, where clients from different fields, as well as research and business organisations (including all forms of companies, associations, public bodies, alliances, and so on) could establish integrated teams of the necessary scope based on the national objectives and implement pilot (demo) projects, take measurements of the expected results, disseminate information on the results, and so on.
- Here, too, it is important that the teams are established freely, with due consideration as to the team competences, experience, and the area that the project covers (its relevance to the sector), rather than limiting them by type of organisation or form of representation (public sector, business company, business association, public body, research or educational institution, and so om).
- These programmes should come with uniform descriptions of applications and rules of funding. Invitations should have their priorities and goals, and applications could be filed by integrated teams of all groups concerned with the theme, including business, research and client, private and public sector organisations, companies, business associations and other organisations.
- The following are examples of themes of integrated pilot (demo) projects that can be launched by business and research bodies, associations, public bodies, and other organisations:
    - Active implementation of the methodology to evaluate the criteria of green procurement and economic efficiency in projects throughout the building lifecycle over a period of 10–20 years or more under the BIM methodology. Envision obligatory measurement and assessment of results in terms of conformity to the targets. Integrate requirements for the technological solution lifecycle and the selection of solution variations based on harmonised quality of life, economic efficiency, sustainability, security, effectiveness, and other objectives. Include new and modernisation projects, different municipalities.
    - Development and integration of innovative building engineering systems, solar energy, and electric vehicles in offices, public and residential buildings, using digital building twins, and assessment of the effectiveness thereof.

○ Various demonstration projects as per demand for the testing of the methodologies of other measures designed under this plan and the testing of the implementation of various technologies.								
A12. Update the economic efficiency criteria of the VPT (Public Procurement Agency) guidelines for the public procurement of design services and of construction work with criteria for the evaluation of specialist and company experience, aligned with the established 2030 objectives of sustainability, energy efficiency, and digitalization	Prepare updates; Have them approved by client organisations and associations in public sector; Approve and publish;	Apply; Evaluate results;	Revise;	VPT; AM; Professional self-governance bodies; Business associations SKST	-	All public procurements done under updated requirements.	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance
At this time, the approved methodology of the guidelines for the public procurement of design services and of construction work does not include any criteria for the evaluation of economic efficiency criteria to evaluate not only the bidding team's abilities against the minimum obligatory requirements for its qualifications and the quality of the building, but also its ability to do this effectively (rationally), meaning the ability to choose both cost-effective and rational solutions of technology, products, and materials, the ability to produce a BIM model on time and in good quality, the ability to implement the project within the boundaries of the budget and the timeframe, as well as its experience in doing so and other above-minimum competences relevant to the objectives. In this context, both the experience of individual specialists engaged in the project and the experience of the companies in implementing projects needs to be evaluated. Evaluating only specialist competences in the process of procurement (rather than at the time of awarding the contract) is inefficient, for this may, first and foremost, encourage a hunt for specific specialists on the market to engage them in a tender, and later, when the project is already underway, the specialist introduced during the procurement may not necessarily be involved in the project, which may essentially complicate the economic efficiency of the procurement process and practice. This damaging practice is actually happening right now. In this context, it is important to bear in mind that in the course of the project the winner must always ensure the implementation of the project to the extend formulated in the specification, observing the guidelines for the quality of the project as well as its timeframe and budget. The suggested logic is as follows: ● The minimum procurement requirements for the competences and experience of specialists and companies will be formed so as not to limit the competition. ● The economic efficiency requirements for the competences of specialists and companies will be applied to select a team considering all aspects of the bid (the minimisation indicator) and the ability of the bidding company (or group of companies) implement the project in a rational and effective manner.								

- It is important to evaluate the contractor's ability to offer rational and effective, energy-efficient, sustainable and durable solutions of products and materials during the lifecycle of the project, implement the project within the boundaries of its timeframe and budget, guarantee security and the achievement of other objectives, and its experience in doing these things. This can be measured against the providers' experience in implementing projects to the recognised above-minimum requirements for managing good practice projects, sustainability, or other standards or methodologies that are recognised on the market.
    - The inclusion of the criterion of the economic efficiency of the company would make it possible to evaluate the company's aspects of project implementation, resource management, good practice, and teamwork in a simple and well-rounded way.
    - The suggestion is that the criteria for the assessment of economic efficiency of the public procurement of building design, construction, and operation services should be expanded with the addition of criteria for the evaluation of companies' good practices and experience in applying international standards during project implementation (such as passive home, BREEAM, LEED, LPTVS (Lithuanian Building Sustainability Assessment System) developed by the Lithuanian Green Building Council (LGBC), LEVELS or other sustainability standards, BuildingSMART certificates, winners in BIM model competitions (BIM Awards), and so on).
- All associated business and public organisations existing on the market should be engaged in the drafting of the lists of these criteria.

It is a very important aspect when it comes to the continued evolution of the self-regulatory system for the upskilling of companies and specialists and the achievement of security, sustainability, and other goals.

In the long term, this will increase the competitiveness and security of the Lithuanian construction market, drive a gradual and continuous growth of solutions in the field of sustainability and waste-free technology and longevity, and promote the market participants to constantly advance their qualifications and try to attain other current and future goals and objectives.

A13. Update and deploy on the market SKST BIM methodology templates (EIR, BEP and others) (to include the phases of building design and construction, transfer of construction to the phases of operation and maintenance), **integrating them in the outcomes of the BIM LT project**.	Update methodology (through integration into BIM LT outcomes); Enact SKST methodology	Training. Deployment Measurement of results. Revisions of methodology	Training. Deployment Measurement of results. Revisions of methodology	SKST; Business associations; Purchasing organisations; Research bodies; AM; SSVA;	Business; Purchasing organisations	SKST BIM methodology updated and deployed on market. Methodology applied to projects funded with EU or state moneys.	Market factors Legal regulation;	Planning and design; Building operation and maintenance

Founded in 2014, Skaitmeninė Statyba (Digital Construction), a public body that has 13 associations and alliances as its members, designs various practical documents of BIM requirements (considering the global good practice of developing BIM models), organizes communication, trainings, BIM awards competition, and other activities in the area of digitalisation of the construction sector in Lithuania. The organisation has created a number of EIR, BEP, LOD, and other practical

templates of BIM requirements, which have seen successful used within application in various public and private procurement tenders since 2017. SKST documents are available at https://skaitmeninestatyba.lt/dokumentai/ .

In 2019–2023, the Environment Ministry carried out the BIM LT project, which included production of various documents on BIM methodologies and requirements: https://statyba40.lt/

- Business and research teams should proceed with testing, harmonising, and expanding the practical elements of the SKST BIM methodology, using the methodological material from the BIM LT project that was produced in 2023;
- Furthermore, the SKST BIM methodology should be expanded, on a structured basis, with new OpenBIM standards and formats (such as IFC4.3; IFC5; BCF3.0, IDS, bsDD, to name a few) that have been under consistent development since 1994, promoting their deployment on the market. https://www.buildingsmart.org/
- The methodology should also stipulate that for projects that are subject to BIM requirements, the procurement specifications must include a requirement that, starting with the design phase, the development of BIM models must consider the choice of technological solutions and materials until the phase of operation and maintenance, with the potential phase of disposal of the products and materials in mind.
- Project coordination processes must envision project compliance with the operation and maintenance requirements.
- The phases of building operation and maintenance must provide for activities aimed at adopting and updating BIM.

A14. Initiate amendments to the regulations establishing a **mandatory transfer of 0.25% of the salary** to a special fund for ongoing **upskilling**.	Prepare and approve draft amendments	Begin accumulating funds	Begin using funds for training	Government bodies; Business associations; Professional self-government bodies;	EU and state aid or other instruments of incentivisation	Fund transfers made for at least 40% of persons involved in upskilling (LTKS III–VIII)	Market factors Legal regulation;	Planning and design; Construction; Building operation and maintenance

Right now, there are no effective measures to promote upskilling where it is not made legally mandatory. In areas where upskilling is mandatory, in most cases, the qualifications are developed under the minimum set of requirements only, which is not enough to make appropriate progress in the sector.

- A stable framework of funding and organising professional upskilling should be set up in Lithuania.
- When it comes to drafting regulations, the experience of Western and Nordic countries spanning a period of many years should be analysed and employed.

A15. Improve career counselling for school students and engagement of skilled university and school students in the construction sector through the involvement of business and associations in the sector.	Enact and declare Week of Engineering at schools; Establish and grant business scholarships to students;	Engage with schools (at least 60); Establish and grant business scholarships to students;	Engage with schools (at least 120); Establish and grant business scholarships to students;	RL Ministry of Education, Science, and Sport; Lithuanian Association of Construction Engineers; Lithuanian Builders' Association	EU and state aid, funds from sector associations	Ongoing Week of Engineering events for grade 5 and 9 students. More than 180 schools visited	Market factors Legal regulation;	Planning and design; Construction; Building operation and maintenance
The quality of career counselling has improved over the past few years, but it still remains rather general and does not make any impact on students' choice of a career path or is highly ineffective in terms of engineering professions, as evidenced by the low number of students enrolling to study engineering. ● Specific instruments are required to achieve better coordination of the direct engagement of the most forward-looking representatives of the sector in career counselling. ● Members of engineering and business associations should be encouraged to engage with schools. ● Develop a practice of business organisations setting up business scholarships for school and university students. These and other measures should net a 20% increase in the number of engineering students.								
A16. Design broadly accessible self-tests to be taken at any level **(from LTKS II to LTKS VII) to self-evaluate one's knowledge and identify areas for improvement and set the appropriate goals**.	Free test app developed. Minimum number of tests developed.	STATREG system upgraded, test app developed and integrated.	Monitoring and improving test usage.	Lithuanian Builders' Association Other associations SKST	EU and state aid	30% increase of training demand in sector	Market factors	Planning and design; Construction; Building operation and maintenance
Today, we do not have a simple and effective tool on the market for market participants to self-evaluate their own competences and identify areas for improvement. ● The plan is to reach out to a broader audience of students, workers, and engineers with popular, simple means and communication channels, and stir their interest in innovation news, potentially engaging them in an ongoing process of upskilling.								

• A simple mobile app offering a broadly accessible choice of simple and exciting tests and problems could be a good way to excite interest in the most relevant themes.								
A17. Devise a digital campaign on the successful involvement of women in construction, complete with dissemination of success stories on TV and social media, and **enact a Bring Your Child to Work day for women**.	Information campaign project	Monthly stories on TV, radio, social media	Bring Your Child to Work day for women enacted	Business associations and professional self-government bodies	EU and state aid		Market factors	Planning and design; Construction; Building operation and maintenance
Due to the specifics of the sector, the number of women involved in the construction sector in Lithuania and worldwide currently is relatively small. • With the construction sector rapidly changing, the range of activities that may fit and appeal to women is expanding, yet no efforts have been made to disseminate this information. This measure could result in a better balance of workforce in the sector, new opportunities for the construction sector, and a way to address the shortage of specialists to some extent. • The campaign must engage all celebrated Lithuanian women and women's organisations such as the Lion Club, the Lithuanian Association of Soroptimist Clubs, and so on. • The Bring Your Kind to Work day ideally should apply to men as well.								
B. FORMAL AND INFORMAL (CONTINUED) UPSKILLING								
B01. Update the Professional Standard of the Construction Sector.	The existing 37 formal qualifications assessed and plan for updates and revisions drafted.	Programme descriptions prepared and filed for approval to professional committee of construction sector.		Professional committee of construction sector	KPMPC	Professional Standard of Construction Sector revised and formal education programmes updated	Market factors Legal regulation;	Planning and design; Construction; Building operation and maintenance

Even though the Professional Standard of the Construction Sector was approved in 2019 and is therefore relatively new, experts believe that qualifications should be reviewed and updated, their list enhanced with the addition of new ones that have relevance to the sector.

- A review of all 52 formal LTKS level III–VIII qualifications embedded in the Professional Standard of the Construction Sector (PSF01) has revealed that 37 qualifications should be enhanced with the addition of missing competences, and the current competences should be revised and updated in line with the demands expressed by the sector and updated in the process of development.
- Realising the importance of developing the qualifications and competences of persons currently involved in market, it is important to make sure that graduates of formal teaching programmes or studies entering the market should also have the latest qualifications and competences relevant to the market and be able to begin working without the need to develop any additional qualifications.
- Level III–V qualifications should be enhanced with the addition of the ability to read and apply the BIM model in performing tasks, understand sustainable construction principles and general requirements, use AI-based and other automated tools and equipment, as well as the knowledge of and skills in the latest modules of occupational safety.
- Level VI–VIII qualifications should be enhanced with the addition of competences in the area of managing the process of BIM model applications, BIM model development, coordination of its applications, management competences, and knowledge of the sustainability requirements for buildings and construction processes that goes beyond what currently applies, competences of managing AI tools and equipment, as well as competences in the field of application of automated systems and organisation of health and safety with scheduled modular training.
- For the purpose of making the updates, a decision needs to be made as to which competences of the standard should be updated, and where the updates could only concern the curricula, without changing the standard as such. Information about the changes to the standard should be communicated to all formal and informal training establishments.

B02. Develop and approve the Electrician's Professional Standard.	Electrician's Professional Standard drafted and approved	100% of formal curricula updated.		KPMPC, NETA, business associations and research bodies	ŠMSM, KPMPC	Qualifications and competences defined as per Electrician's Professional Standard	Legal regulation;	Building operation and maintenance

The Lithuanian system of qualifications is grounded on professional standards. While other qualifications already have their professional standards in place (such as the Professional Standard of the Construction Standard), no standard of competences in the field of energy exists in Lithuania.

- The new standard of the electrician will mirror the necessary qualifications of electricians and building automation and maintenance specialists of all levels. It is a task to be addressed at a national level, one that will provide grounds for a restructure and improvement of the qualifications of the electrician's professional standard in reliance on modern technologies and market needs.
- The standard should provide for the **qualifications** of the (construction) **engineer, building maintenance specialist, solar energy installers, heat pump installation and maintenance specialists**.

B03. Continuously **update and create new curricula for purchasing organisations and clients**, considering the changing market needs and in line with the established goals and new or updated project management, sustainability, digitalisation, or other methodologies, regardless of the current qualifications of persons.	Prepare and/or update curricula	-	Prepare and/or update curricula	VPT; SKST; Professional self-governance bodies; Business associations	EU and state aid	Curricula reviewed and updated against market needs at least once in 3 years	Market factors Legal regulation;	Planning and design;
No structured curricula and trainings for clients and representatives of purchasing bodies where knowledge and good practice solutions regarding the changes taking place on the markets, new goals, and integrated project work teams could be conveyed in an effective manner are being organised on the market at this time. ● Informal curricula for clients and representatives of purchasing bodies should be prepared in line to relevant goals.								
B04. Continuously **update or design new informal upskilling programmes for architects and construction engineers and building engineering system specialists (LTKS VI–VIII),** to include and highlight BIM, sustainability, energy efficiency, and smart technology themes based on the objectives in place.	-	38 new building engineer upskilling programmes, replacing existing ones; Upskilling programmes for 60% of new architects, replacing existing ones;		Professional self-government bodies; Research and educational institutions; Associations; SKST;	Training organisations, EU funding	100% complete informal continued training under new curricula	Market factors	Planning and design; Construction; Building operation and maintenance

Upskilling programmes must be constantly updated in the light of the changes taking place on the market. The duty to update lies with the training institutions. At this time, informal curricula for engineers are registered by the SSVA, and for architects, by the LAR.

Bodies engaged in informal training must change their curricula based on market demands. The legal duty to update once in every 5 years lies with the training organisations. Curricula for construction engineers are registered by the SSVA, and for architects, by the LAR.

When the goals in the areas of energy efficiency, sustainability, digitalisation, among others, are updated or new goals are set, the curricula must be reviewed and updated as appropriate.

- The **38 programmes** for the upskilling of engineers were prepared prior to 2019 and are published at https://www.ssva.lt/registrai/spmokprog/programs_list.php?pagesize=100 must be updated in the light of the changes in the objectives, besides, they are due for an update every 5 years.
- Programmes for the upskilling of architects are available at https://www.architekturumai.lt/kursai/lar-kursu-programa/ and https://am.lrv.lt/lt/veiklos-sritys-1/architektura-ir-inovacijos/aplinkos-ministerijos-suderintos-architektu-kvalifikacijos-tobulinimo-programos-1/.
- Other key steps include dissemination of information and employer initiatives so that these organisations realise how necessary it is to adequately overhaul their programmes. This Roadmap and updates to the professional standards may be highly instrumental for the purposes of drafting updated informal curricula.

B05. Continuously update and develop **informal curricula for contractor workers** (**LTKS III–V),** to include BIM, sustainability, energy efficiency, and smart technologies based on the established objectives, and **organise training for construction workers**.	Current informal competences appraised and suggestions to update them prepared.	Suggestions filed to training providers and any improvements thereto discussed.		Lithuanian Builders' Association and other associations in sector	EU and state aid or other instruments of incentivisation	90% informal competence training available on market updated	Market factors	Construction;

Informal curricula do not require registration or accreditation. It can be done, but Lithuania does not have a tradition to formalise informal trainings on a mandatory basis yet and this process has been left for the market participants to organise. The most relevant and popular trainings on relevant themes are available online or from employers. It is the opinion of employers that informal trainings should be constantly updated to take the market needs and the latest in technology into consideration.

With the IEE ENERGOTRAIN project implemented in 2016, the Lithuanian Builders' Association and partners paved a path for, designed and launched 14 energy efficiency curricula for workers in the construction sector and established STATREG, a system of the competences register of the Lithuanian construction sector (https://statreg.lt)/.

Responding to the mounting new requirements for energy efficiency, circular economy, and digitalisation, in 2022 the LSA, in association with the Vilnius Builders' Training Centre and EU partners, finished implemented the Erasmus project of BLUEPRINT https://constructionblueprint.eu/. The energy performance, circular economy, and digitalisation curricula developed and launched within the scope of this project are fully aligned with the goals of this roadmap, and efforts must be taken to ensure the continued deployment of the programmes that have been developed and tested on the market. ● The implementation of this measure should be tied directly to the continued activities of the BLUEPRINT project as implemented at the EU initiative in 2022, https://constructionblueprint.eu/lt/. ● Organisations offering informal trainings must adapt their curricula accordingly. Further dissemination of information and employer initiatives are needed for these organisations to realise how necessary it is to overhaul their programmes. ● Various centres for vocational training in Lithuania also offer informal trainings, with a total of 10 programmes requiring updates once the professional standard has been modified and the new goals have been considered. The programmes are available online at https://vsrc.lt, https://techin.lt, https://kautech.lt, https://www.gpmc.lt. ● https://www.kursuok.lt has a list of new programmes that need not be updated at this time. ● Informal curricula for workers in the construction sector should be reviewed and updated against the relevant goals at least once in every 3–5 years, to account for the changes in the rapidly developing technologies.								
B06. Update 24 **formal curricula (LTKS III–VIII)** against the revised standard PSF01, to include BIM, sustainability, energy efficiency, smart technology, and other themes based on the objectives in place.		Updates to 24 formal curricula produced		KPMPC; Research and educational institutions	KPMPC, EU and state moneys	100% vocational training centre and high school graduates complete new curricula	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance
● Once the professional standard of construction has been updated, all education establishments must update all 24 of the existing formal curricula for the construction sector that are currently in place. The programmes are available in the Open Information and Counselling System AIKOS at https://www.aikos.smm.lt. Being aware of the directions and the requirements, the educational establishments will update the programmes without much problems. ● The organisations that offer trainings using technologies that have the highest degree of impact based on the market needs and BuildUpSkills 2030 must modify their curricula accordingly. Dissemination of information and employer initiatives are required for these organisations to appropriately change their programmes and boost employers' confidence in the trainings offered.								
B07. Regularly **develop the competences** of teachers and lecturers at **educational**	Teachers' trainings organised	Teachers' trainings organised		Authorised bodies	Moneys from organisations offering	At least 76 specialists trained and prepared to	Market factors	Planning and design;

establishments offering informal upskilling programmes for authorised architects and engineers, **add new market participants (experts) with a lot of experience** to the teacher (lecturer) base.					trainings and EU projects	teach under updated programmes.		Construction; Building operation and maintenance
All organisations offering training always point to the lack of teachers and lecturers as a challenge on the road to improving the quality of their trainings. Specialist training would help close this gap, especially once most of the curricula have been updated. ● Teachers should be provided with training to boost the ties and cooperation between educational establishments and associations and forward-looking business. ● Focus on the application of real-life practice and latest technologies in training (such as robots from Boston Dynamix, 3D printing, drones, 3D scanners, new sustainability and green construction products, the latest technology in BIM model development, simulation, and application, among other things). ● Look for solutions to how continuous funding (aid and incentivisation) can be secured so that educational establishments can deploy and use the latest technologies. ● Lists of authorised bodies are available at https://www.ssva.lt/registrai/spmokprog/programs_list.php?a=showall and https://www.architekturumai.lt.								
B08. Regularly **organise continued informal training for clients in the private sector** in green procurement, sustainability criteria, digitalisation, and other areas, based on the objectives in place.	120 client organisations trained	180 client organisations trained		Sector associations and educational establishments	EU project and state aid	At least 300 specialists trained. 100% of clients able to set and control public procurement requirements as per updated goals	Market factors	Planning and design; Construction
Clients (builders) are a key party to the construction process. Achieving sustainability, green deal, digitalisation, and other objectives creates new roles and responsibilities for builders as well; as a result, specialist training can greatly accelerate their adaptation on the market. At this time, there are no structured trainings for representatives of public and private purchasing organisations available on the market to effectively convey knowledge and good practice solutions regarding market developments, new objectives, and the practice of working in integrated project teams.								

• When it comes to purchasing building design, construction, and operation and maintenance services, the purchasing team must include at least one specialist with competence in the field of construction who is able to expand and refresh their knowledge under the programmes available on a regular basis. • Scope of training: good practice in formulating the objectives (regarding the quality of life, energy efficiency, sustainability, safety, and so on), procurement of services and works under economic efficiency criteria, project implementation under BIM methodology, and so on.								
B09. Regularly **organise continued informal training for non-engineering staff** (management, legal advisers, environmental protection specialists, process and product managers) **of contractors** in green procurement, sustainability criteria, digitalisation, and other areas, based on the objectives in place.	120 representatives trained	200 representatives trained		Sector associations and educational establishments	EU project and state aid	At least 320 specialists trained.	Market factors	Planning and design; Construction
Surveys of design and construction contractors have shown green procurement to be the most desirable training theme today, and considering the amount of changes expected to take place over a brief amount of time, this type of training will remain in demand for at least another three to five years. • Scope of training: good practice in formulating the objectives (regarding the quality of life, energy efficiency, sustainability, safety, and so on), procurement of services and works under economic efficiency criteria, project implementation under BIM methodology, and so on.								
B10. Regularly **organise continued informal training (LTKS VI-VIII) for designers** (architects, engineers, engineering system specialists and other design specialists) under programmes updated against the objectives in place.	Organise trainings	Organise trainings	Organise trainings	Professional self-government bodies; associations; SKST; business associations; research and educational establishmen	Business moneys; EU and state aid or other instruments of incentivisation	At least 3,500 certified architects and design engineers trained under updated programmes by 2030. This accounts for roughly 30% of all	Market Regulation	Planning and design

				ts (with active engagement of corporate practitioners)		specialists in design sector		
● Considering the very ambitious goals in place and the rapid development of digital and construction technologies and materials, the existing procedure should be improved as well, offering 20 hours of training every three years instead of every five years, made mandatory under updated programmes and the upskilling requirement. ● Also envision a legal possibility to credit lectures under approved programmes and other recognised forms of upskilling such as goal-related conferences, workshops, internships, attendance of sectoral exhibitions related by field, among other things, as hours spent developing qualifications.								
B11. Regularly **organise continued informal training (LTKS VI–VIII) for engineering staff of construction contractors** in BIM, sustainability, energy efficiency, smart technologies, and other fields under programmes updated on the basis of the objectives in place.		940 engineers trained	860 engineers trained	Authorised organisations	EU and state aid or other instruments of incentivisation, private moneys	At least 30% employees having developed their competences under new programmes	Market factors	Construction;
Currently, Lithuania already has a professional sector approved in the construction sector, with a variety of informal trainings organised and a compulsory requirement to undergo upskilling for at least 20 hours every five years in place ● Considering the very ambitious goals in place and the rapid development of digital and construction technologies and materials, building operation and maintenance specialists should be required to attend 20 hours of training every three years, made mandatory under approved programmes and the upskilling requirement. ● Also envision a legal possibility to credit lectures under approved programmes and other recognised forms of upskilling such as goal-related conferences, workshops, internships, attendance of sectoral exhibitions related by field, among other things, as hours spent developing qualifications.								

B12. Design continued informal curricula for building operation and maintenance specialists (workers) (LTKS III–V) and regularly **organise trainings** in BIM and AI, IT systems and data analysis in buildings, considering the objectives in place.	600 curricula designed	1,200 persons trained	1,200 persons trained	Lithuanian Builders' Association and other associations in sector	EU and state aid or other instruments of incentivisation, private moneys	Have at least 50% (3,000) of employees brush up on their competences under curricula in place	Market factors	Building operation and maintenance
At this time, there is no professional standard of electrician in place and trainings of workers involved in building operation and maintenance are too scarce and too fragmented. ● Building engineering systems (electrical, automation, BMS, HVAC, plumbing, fire safety) require an increasingly high level of IT and technological knowledge, requiring workers involved in building maintenance to have a basic level of knowledge of BIM and IT systems. ● It is critically important that the missing knowledge could be acquired under a convenient curriculum delivered by either private specialist training companies or branch business associations.								
B13. Design continuous informal curricula for building operation and maintenance engineers (LTKS VI–VII) and experts (LTKS VIII) and regularly **organise trainings** in building engineering system sustainability and digitalisation/automation, considering the objectives in place.	Curricula designed	35 experts trained. 400 engineers trained.	50 experts trained. 800 engineers trained.	NETA, LSA	EU and state aid or other instruments of incentivisation, private moneys	Have at least 50% of employees brush up on their competences under curricula in place	Market factors	Building operation and maintenance
Today, the requirements for building maintenance and technological solutions are progressing faster than the current offering of trainings, with the shortage of curricula for leaders/experts in this field and training establishments particularly pronounced.								

At this time, there is no professional standard of electrician in place and trainings of workers involved in building operation and maintenance are too scarce and too fragmented.

- Therefore, trainings of construction and electrical and energy engineers under the pending electrician standard and new or updated programmes would appear as a timely and very important instrument to satisfy the demands of the construction sector.
- The key themes of such trainings would be the basics of building lifecycle analysis, low-carbon building engineering systems, building management systems (BMS), electrical systems, HVAC systems, heat pumps, water collection and recycling systems, solar energy generation and usage systems, energy accumulation and battery system, electric vehicle system integration, and other fields related to the objectives in place.
- Also envision a legal possibility to credit lectures under approved programmes and other recognised forms of upskilling such as goal-related conferences, workshops, internships, attendance of sectoral exhibitions related by field, among other things, as hours spent developing qualifications.

B14. Design continuous informal curricula for building operation and maintenance engineers (LTKS VI-VII) and regularly **organised training** in building management system (BMS) and related data analysis and prognostication, considering the objectives in place.	Curricula designed	150 persons trained	300 persons trained	Lithuanian Builders' Association and other associations in sector	EU and state aid or other instruments of incentivisation, private moneys	Have at least 50% of employees brush up on their competences under curricula in place	Market factors	Building operation and maintenance

Building engineering systems (electrical, automation, BMS, HVAC, plumbing, fire safety) require an increasingly high level of IT and technological knowledge, requiring workers involved in building maintenance to have fresh knowledge of BIM and IT systems that they could apply in projects.

- It is critically important that the missing knowledge could be acquired under a convenient curriculum delivered by either private specialist training companies or branch business associations.
- The organisations that offer informal trainings using technologies that have the highest degree of impact on the construction sector as identified on the basis of the market needs and BuildUpSkills 2030 must modify their curricula accordingly.
- Dissemination of information and employer initiatives are required for these organisations to realise how necessary it is to modify their programmes.

C. EVALUATION, RECOGNITION, AND CERTIFICATION OF COMPETENCES								
C01. Update the certification system for architects (LTKS VI–VIII) to consider the objectives and methodologies in place, aligning it with the qualifications of the Professional Standard of the Architecture Sector and the updated classification system	Draft updates to architect certification system	Architect certification under updated system		LAR; AM; SKST;	LAR; State aid and incentives	1,400 architects certified under updated certification system	Market factors; Legal regulation	Planning and design
Today, the architect certification system is grounded on self-governance. The Professional Standard of the Architecture Sector was approved after the certification system had been established to operate on a self-governance basis. ● The certification system relies on the professional standard and other measures formulated by the work groups in the Roadmap; therefore, the system needs to be updated and aligned with other actions relative to upskilling and the development of qualifications.								
C02. Upgrade the system for the certification of construction engineers (LTKS VI–VIII), considering the objectives and methodologies in place, in many cases replacing certification with awarding professional qualifications under the Professional Standard of the Construction Sector.	Law on Confederation (Self-governance) of Lithuanian Construction Engineers drafted. Amendment to RL Law on Construction drafted	Law on Confederation (Self-governance) of Lithuanian Construction Engineers enforced.		Sector's engineer associations; SKST; AM;	EU aid and moneys of sector's engineer associations	100% of engineers newly certified under Law on Confederation (Self-governance) of Lithuanian Construction Engineers	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance

Currently, the provisions of the LT Law on Construction significantly diverge from those of the Professional Standard of the Construction Sector. There is a pronounced gap in the certification guidelines for architects and engineers, with engineer certification done by a state body (authorised by the SSVA), and architect, by a self-government body (the Lithuanian Chamber of Architects). ● All market participants agree that the engineer certification system must be overhauled on a fast track and on a large scape, in the light of the objectives and measures envisioned in this Roadmap. ● The possibility to assign the organisation of engineer certification activities to professional self-government bodies in the construction sector, working in partnership with associations, should be considered.								
C03. Update the system of certification for experts in energy efficiency and sustainability (LTKS VI–VIII), considering the objectives and methodologies in place.	Draft updates to building energy performance expert certification system	New energy performance expert certification system legally in place		NPNA; LGBC; SKST; AM; SSVA	Business; State aid and incentives	30 experts certified under updated energy performance expert certification system	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance
There is a Building Energy Performance Expert Certification System currently in place in Lithuania. ● Efforts should be made to closely examine the need for the development of a new building sustainability assessment competences and to expand the existing certification system accordingly. For the purposes of developing this system, the experience of the systems already available on the market (such as BREEAM, LEED, Passive House, LPTVS (Lithuanian Building Sustainability Assessment System) developed by the Lithuanian Green Building Council (LGBC), Levels, or some others) should be considered.								
C04. Upgrade, test, and enact the construction information classification system based on the sector's needs, considering the objectives and methodologies in place.	Draft updated classification system available. Classification system enacted			AM; Business associations and professional unions; SKST	EU and state aid or other instruments of incentivisation, private moneys	Updated classification system fully applied in certification, projects, issuance of construction permits	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance

The classification of construction information must cover buildings by function, buildings by category, functional and technical systems and elements of buildings, construction works, qualifications, competences, project parts, and other anthological elements. Some part of the classification system must be made legally compulsory for the purposes of certification, projects, the issuance of construction permits. Another part must be made legally suitable to use in BIM projects at the discretion of designers and builders and manufacturers.

- The classification system must be tested and developed further by making improvements to the original version designed in 2023 under the BIM-LT project and the legally adopted National Construction Information Classifcator (NCIC).
- Any improvements to the construction information classification system must take account of the constantly evolving buildingSMART formats, standards, and dictionaries (IFC, BCF, IDS, bsDD, and so on). This is critical for the purposes of integrating into the non-profit networks that develop the international standards and formats for the exchange of information in the construction sector and facilitating integration into the EU and global construction market for companies in the Lithuanian construction sector.
- The continued process of developing and testing the NCIC must involve SKST, construction business associations, client organisations from the public sector, and research bodies.

C05. Enact the STATREG system of the register of competences in the construction sector by expanding it to other fields. **Enact the use of a system of informal competences and cards for the purposes of managing formal and informal qualifications and competences (LTKS II–VIII) at construction sites**.	Suggestions for enactment of competences system prepared. System enacted.	All graduates of vocational curricula receive STATREG cards and have their qualifications and competences registered in system.		SADMIN; LSA; SKST; Professional self-government bodies	EU and state aid or other instruments of incentivisation	100% of graduates of formal and informal trainings get STATREG account where their qualifications and competences are recorded	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance

Through the activities of the IEE ENERGOTRAIN project that was completed in 2016, the Lithuanian Builders' Association and partners have designed the requirements for the evaluation of 14 energy efficiency curricula for and the hands-on skills and theoretical knowledge of workers, experts, and foremen (LTKS II–IV), as well as the STATREG system (https://statreg.lt), which was tested within the framework of the project. The first e-cards of builder competences were issued to workers in the construction sector. The system has been undergoing continuous development and has been expanded into other areas of construction works, with a model of the construction engineer card designed.

Currently, STATREG works as a register of competences and qualifications of construction sector employees, a competences assessment system, a workhours hours register system, and a set of tools for corporate human resources management.

- The use of innovative technology and construction products fails to provide sufficient evidence to the qualifications, for it is not indicative of the required competences, especially considering that the qualifications were obtained a long time or several years ago. Documents of upskilling also fail to provide a

clear indication of the new competences acquired. Contractors find managing changing competences against paper certificates inconvenient, as it requires a lot of resources and reduces work efficiency. ● The system records (recognises under certain rules) graduation certificates for various good practice training courses. ● Including all participants in the construction process, from design to operation to maintenance, into a single upskilling system should be considered. It is also critical that information about the level of upskilling acquired through informal training of and training attendance by all specialists in the construction sector should be recorded in a single system. ● It is equally important that, during the next phases of development, this system is aligned with the implementation of the BIM methodology through application of buildingSMART OpenBIM formats, and is integrated into the Lithuanian National Classifier of Construction Information (NCCI), which is currently under development.								
C06. Establish a centre of competences for the evaluation and approval of formal LTKS III–V competences.	Suggestions prepared. Approval from sector associations.	Suggestions prepared. Approval from sector associations.	Competence centre established	KPMPC; LSA; SKST; Business associations; Professional self-government bodies; Educational institutions	State	Functioning centre of competences	Legal regulation; Market factors	Construction; Building operation and maintenance
Once formal training is complete, qualifications need to be confirmed through a process of independent evaluation. There is no independent body for this, with the evaluations done by different teachers at the same the training centers. ● The center (or several centers) would improve the coordination and monitoring and development of the evaluations and accelerate the process thereof. ● Establishing this center would allow combining the resources of different organisations and standardising and optimising the activities, enabling different organisations and competence evaluation specialists to learn from each other.								
C07. Update the existing certification scheme for energy workers based on the expected level of readiness and approve the	Certification procedure for persons employed in maintenance	New procedure implemented	New procedure revised	VERT; EM; AM;	Partial EU and state aid or other	350 persons certified	Legal regulation; Market factors	Building operation and maintenance

professional standard of electrician.	of new buildings available			ŠMSM; Business associations; Professional self-government bodies;	instruments of incentivisation			
Today, Lithuania has a system for the certification of energy workers based on the procedure established by the minister of energy of the Republic of Lithuania. No professional standard for the energy sector exists as of today. The measures of project implementation envision the development of this standard. ● Once the professional standard of electrician is available, the above certification procedure will need to be thoroughly reviewed and perfected accordingly. ● This measure should be coordinated with the development of the STATREG system envisioned under other measures, with the certification results that are currently registered in the VERT's systems should also be reflected in STATREG (https://statreg.lt). ● Evaluate the need to create an Electrical worker card within the STATREG structure.								
D. ENSURING FOLLOW-UPS ON THE PROJECT MEASURES AND THE GOALS								
D01. Expand the functions of the existing LSA Qualifications and Competences Committee with the supervision of the implementation of the measures and goals of this Roadmap.	New goals and structure of LSA Qualifications and Competences Committee approved	Monitoring project measures and goals and registering results		Lithuanian Builders' Association	Lithuanian Builders' Association	Standing committee of representatives from all stakeholders, with meetings held on semi-annual basis	Market factors	Planning and design; Construction; Building operation and maintenance

The participants in the BuildUpSkillsLT2030 (REBOOT) project give the LSA the authority to overhaul the LSA Qualifications and Competences Committee and to organise the monitoring of the implementation of the measure plan, delegating their representatives to the Committee and funding and controlling their active participation in the Committee's activities. ● The Committee will organise the monitoring of the measures, discuss the results of the monitoring, and make suggestions for the revisions of measures, if needed. The Committee will cooperate and communicate with the institutions spelled forth in the plan and issue information to the community of the construction sector. ● This will help maintain the platform of construction competences that has been established under BuildUpSkills and other upskilling projects and taken shape naturally within the framework of the activities, which platform includes representatives of all stakeholders. ● The most active stakeholder representatives will be directly engaged in the different activities of the Committee, while other members of the construction competences platform (stakeholder representatives) will be continuously informed about the Committee's doings and involved in the Committee's events.								
D02. SKST to become a full-fledged chapter of the international buildingSMART alliance (buildingSMART Lithuania).	SKST becomes a full-fledged chapter of buildingSMART (buildingSMART Lithuania). bSI professional certification launches in Lithuania.	Continuation of membership; Continuation of bSI activities	Continuation of membership; Continuation of bSI activities	SKST; Innovation Agency	SKST; State aid;	Full-fledged bSI chapter of buildingSMART Lithuania; 500 specialists certified under bSI programme of professional certification.	Legal regulation; Market factors	Planning and design; Construction; Building operation and maintenance
Between 2015 and 2020, SKST was part of the buildingSMART NORDIC Chapter, together with its Scandinavian counterparts. Following reorganisation of the buildingSMART Nordic Chapter, since 2020 all Scandinavian countries have formed their own chapters, such as BuildingSMART Sweden, buildingSMART Denmark, and BuildingSMART Finland. The buildingSMART Norway chapter had been established earlier. After the reorganisation, SKST of Lithuania began preparations to become a full-fledged chapter and attained the status of buildingSMART Lithuania Chapter in Formation. In early 2024, 18 buildingSMART chapters were formed bSI European chapters Forum, representing 22 EU members (including Lithuania) out of 30 EU menbers. Ever since its launch in 1994, BuildingSMART International (https://www.buildingsmart.org/) has been developing, testing, publicising, and promoting OpenBIM construction project model data exchange formats – the IFC standards. At this time, there are IFC2.3 and IFC4.3 diagram versions available. There are some projects underway towards the development of a IFC5 version of the BIM-GIS diagram. Furthermore, there are a slew of other products available or in the pipeline, such as BCF (BIM collaboration format); bsDD (buildingSMART data dictionary);								

IDS (Information Delivery Specification), its development closing to completion; a professional certification programme; the international annual bSI BIM Awards and annual bSI Summits; the INFRABIM and BIM standards development group events, and many other activities.

- Considering the buildingSMART products that are already available or are under development, as well as their value, Lithuania should not go its own way and design its own bespoke solutions without previously adopting what has been and is still being created at the EU and global level.
- The SKST stakeholder base should be expanded with the inclusion of other participants in the sector, in addition to the 13 current business associations.
- The SKST structure should have a client group, which, among other things, would also include purchasing organisations from the public sector.
- In 2024, SKST should become a full-fledged chapter of buildingSMART International (https://www.buildingsmart.org/chapter-directory/).
- Once it becomes buildingSMART Lithuania, SKST should proceed to implement bSI professional certification programmes in Lithuania (https://education.buildingsmart.org/).
- The first step would be to deploy a bSI foundations professional certification model. bSI professional certification programmes can only be implemented in Lithuania once the country has its own budding or full-fledged chapter representing bSI.

D03. To organize the annual competition of the best Lithuanian real estate project "For Sustainable Development". .	Review award regulations in light of established goals Host awards annually.	Host awards annually.	Host awards annually.	LNTPA and partners	Business	Awards held annually	Market factors	Planning and design; Construction; Building operation and maintenance

Each year, the Lithuanian Real Estate Development Association (LNTPA), in association with the Cohesive Development Academy, host awards For Cohesive Development to acknowledge the top RE projects (https://lntpa.lt/renginiai-ir-iniciatyvos/konkursas-uz-darnia-pletra/).

- The evaluation criteria in these awards include the alignment of objectives in the areas of cohesive urban development, quality of life, multifunctionality, access to public transport and other public infrastructure, environmental protection, economy and social matters; aesthetic landscaping and greenery; the quality of architecture; respect for nature and cultural heritage; smart design and construction solutions; technological innovation and originality (PropTech); energy efficiency, sustainability, and resource economy solutions; the conformity of the project with the demands of the real estate market; the economic efficiency of the project in terms of generating added value for the economy; the public reputation and business ethics of the organization (business that promotes a cohesive relationship with the consumers and the public).
- The suggestion is that the awards should be featured among the educational, training, and practice events dedicated to the upskilling of the participants in the construction sector.
- The winning teams of specialists from the key fields (such as architects, designers, engineers, and others) should be credited with at least 14 hours of upskilling, the rest of contestants, with at least 7 hours of upskilling, to be credited over a three-year period of competences evaluation.
- Another suggestion is to consider awarding economic efficiency points to design and construction contractor teams (companies) that have their design projects rated for their economic efficiency in public procurement within the framework of the awards, for instance:
    - Five points to the design team of the winning design project;

- Two points to the design teams of the other design projects each;
- Two points to the contractors of the winning design project;
- One point to the contractors of the other design projects in the awards each;
- Two points to the operation and maintenance company of the winning project;
- One point to the operation and maintenance companies of the other design projects in the awards each.

D04. Organise annual awards of Best BIM Projects in Lithuania	Review award regulations in light of established goals Host awards annually.	Host awards annually.	Host awards annually.	SKST (13 stakeholders); AM; SSVA;	Business	Awards held annually	Market factors	Planning and design; Construction; Building operation and maintenance

SKST has been hosting top BIM project awards since 2016 in Lithuania (https://skaitmeninestatyba.lt/projektai/).

This contest is design to allow market participants to publicise the outcomes achieved throughout the lifecycle of OpenBIM project implementation, with the application of the BIM methodology and the good practice. All design projects submitted for the awards are presented at a public event every year. This has become an annual event where achievements and experience in developing BIM competences can be shared.

Until 2023, more than 200 BIM projects in the public and the private sectors had been presented and evaluated in 9 categories at the 'Top BIM Projects in Lithuania' awards.

- Top Lithuanian BIM project awards should continue to run annually as a measure that has worked out.
- The winners in the annual top Lithuanian BIM projects should be promoted to take part in the international buildingSMART OpenBIM Awards.
- The criteria against which all entrants are rated include the themes of energy efficiency, sustainability, project management effectiveness, team cooperation, development and implementation of digitalisation methodologies, and development of new technology and innovation.
- The suggestion is that this contest be included on the list of events that count towards the education, training, upskilling, and development of hands-on competences and experience of specialists and companies.
- The winning teams of specialists from the key fields (such as architects, designers, engineers, and others) should be credited with at least 14 hours of upskilling, the rest of contestants, with at least 7 hours of upskilling, to be credited over a three-year period of competences evaluation.
- Another suggestion is to consider awarding economic efficiency points to design and construction contractor teams (companies) that have their design projects rated for their economic efficiency in public procurement within the framework of the awards, for instance:
  - Five points to the design team of the winning design project;
  - Two points to the design teams of the other design projects each;
  - Two points to the contractors of the winning design project;

○ One point to the contractors of the other design projects in the awards each; ○ Two points to the operation and maintenance company of the winning project; ○ One point to the operation and maintenance companies of the other design projects in the awards each.								
D05 **Organise annual international conferences Digital Construction. Vilnius for the construction sector**.	Host annual conferences	Host annual conferences	Host annual conferences	SKST; Business organisations; Professional self-government bodies; Purchasing organisations Governmental bodies	Business; State aid	Annual Digital Construction. Vilnius international conferences held every year	Market factors	Planning and design; Construction; Building operation and maintenance
Launched in 2012 on the initiative of the Lithuanian Builders' Association and partners (associations in the construction sector), the international conference Digital Construction. Vilnius has become an annual international event that draws between 250 and 400 visitors from Lithuania and abroad to the city Vilnius. From 2014, the annual conferences have been hosted by Digital Construction (Skaitmeninė Statyba, SKST), a public body, with stakeholders. This has become a traditional event for the upskilling of the participants in the Lithuanian construction sector and for the dissemination of the global BIM, GIS, smart city, design, construction, and building operation good practice projects, digital twins, research and training themes in the area of the digitalisation of the construction sector. ● The annual international Digital Construction. Vilnius conferences should continue to run annually as a measure that has worked out. ○ In addition to SKST's stakeholders, the network of the conference's partners should be expanded with the addition of different other organisations (such as the LNTPA, the Green Building Council, EM, SSVA, CPVA, APVA, the Innovations Agency, and others); ○ Enhance the format of the conference by hosting various energy efficiency and sustainability events for the stakeholders and the promoters of the platform in the future. ● Promote the dissemination of Lithuanian experience at international conferences.								

8. Monitoring of the Roadmap (Continuity)

The purpose of monitoring is to continuously assess the physical indicators for the implementation of the Roadmap measures to ensure that the final objectives of the Roadmap are achieved.

Monitoring is carried out in the following main groups of measures:

1. Monitoring the implementation of the Action Plan measures in the Training Market Demand Creation (A) group of measures.

2. Monitoring the implementation of the Action Plan measures in the Continuing Competence Development (B) group of measures.

3. Monitoring the implementation of the Action Plan measures in the Assessment, Recognition, Certification (C) group of measures.

4. Monitoring the implementation of the measures of the Action Plan in the group of measures to ensure the continuity of the Construction Competences Platform (D).

The institution responsible for monitoring - the Lithuanian Construction Association (LSA) - is the manager of the monitoring system, ensures the supervision of the monitoring system for the implementation of the roadmap measures, formulates requirements for the monitoring participants at the strategic level, coordinates the activities of the monitoring participants, and manages the monitoring register (an electronic data collection and analysis system). Using the results of the monitoring, the organisation carrying out the monitoring can analyse the measures included in the Roadmap and propose corrective actions. In order to monitor the implementation of the Roadmap measures, the LSA renews and expands the existing LSA Committee on Qualifications and Competences (hereinafter referred to as "the Committee") to include representatives of other associated organisations in the construction sector, monitors their active participation in the Committee's activities, and organises the monitoring of the implementation of the Roadmap measures. The Committee will organise the monitoring of the implementation of the measures, discuss the results of the monitoring and propose adjustments to the measures if necessary. The Committee will cooperate and communicate with the institutions identified in the Roadmap and inform the construction community about the results.

The monitoring of the implementation of the Roadmap measures in groups A, B, C and D will be carried out by a Coordination Group for the implementation of the measures, set up by the Monitoring Scheme Manager and composed of members of the Committee and experts in the relevant field, appointed by the Monitoring Scheme Manager.

External experts and consultants may be involved to support the monitoring system, if appropriate expertise is needed. These participants will provide technological support (system extensions, interfaces), data interpretation, analysis and other consultancy services for the Monitoring System. External experts and other institutions (e.g. the State Data Agency), which have access to the data needed for monitoring, may also participate indirectly in monitoring. The monitoring actors and their interactions are presented in Figure 8.1.

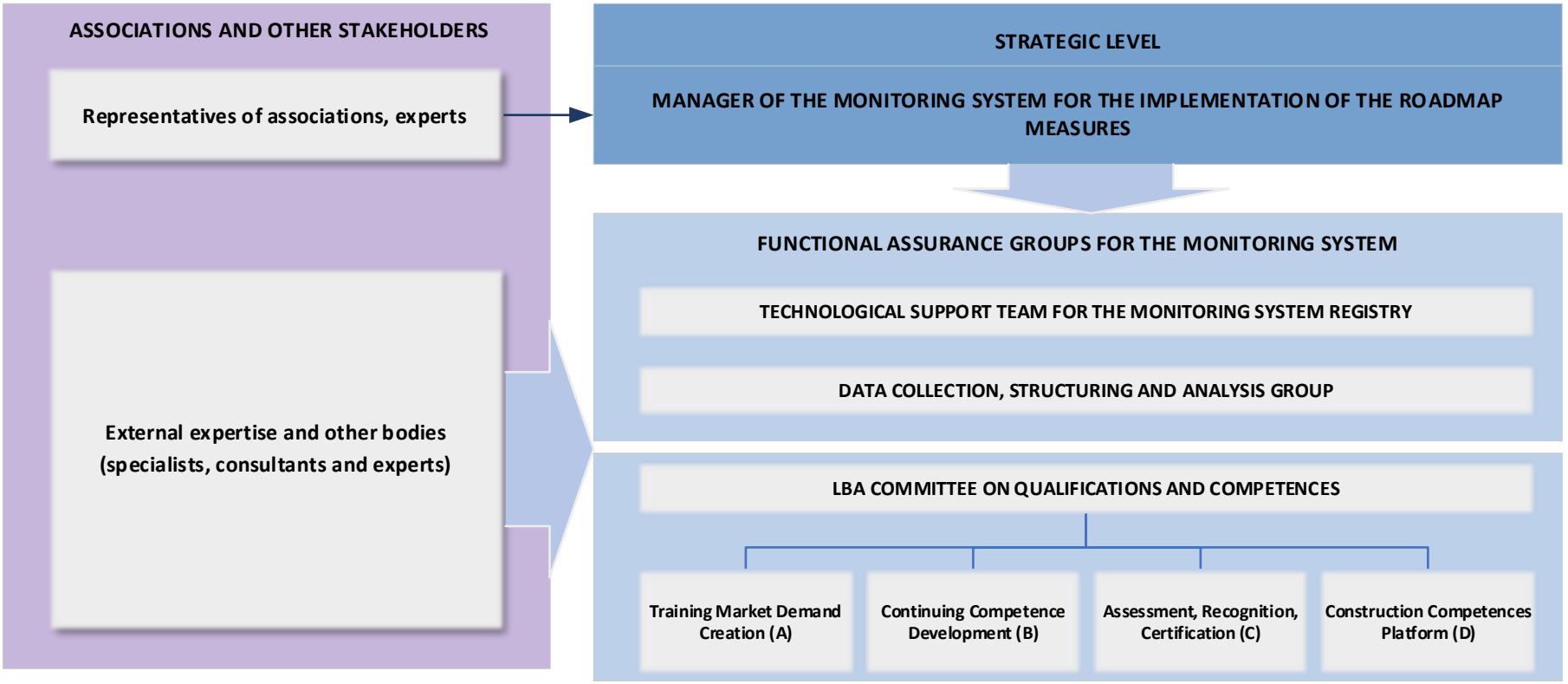


Figure 8.1. A model of the monitoring system for the implementation of the Roadmap measures.

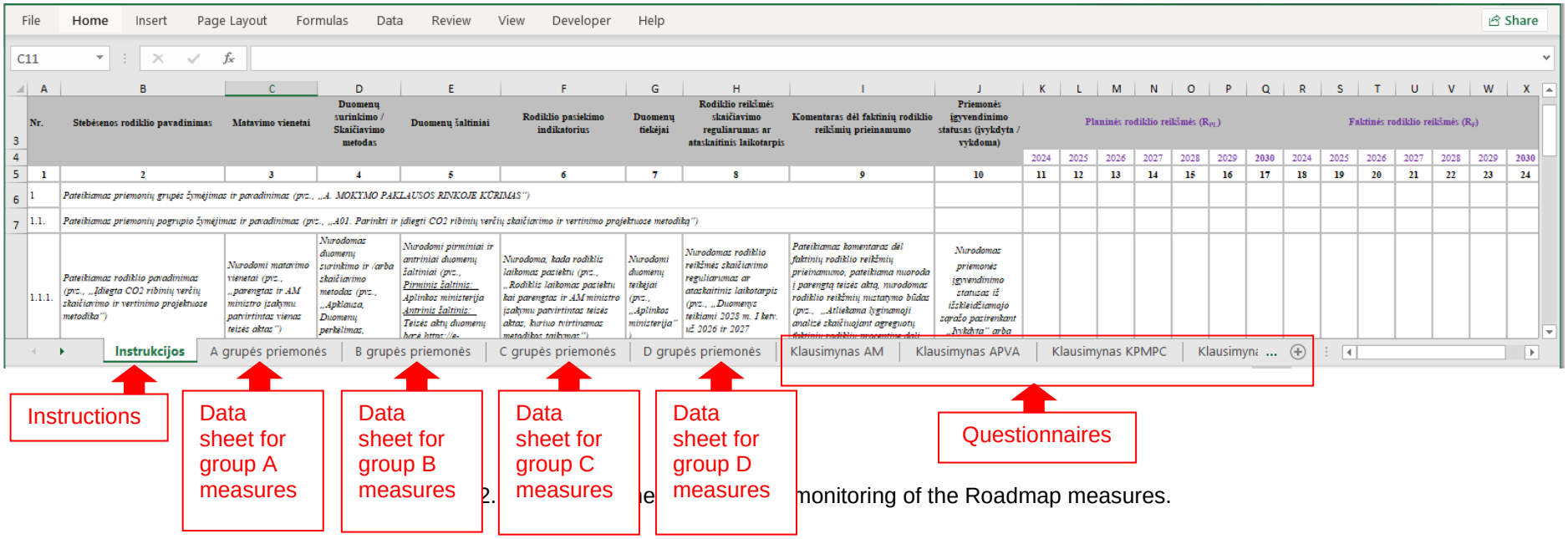
The indicators for monitoring the implementation of the Roadmap measures are based on the values in column 5 of the Roadmap.

For each indicator, the units of measurement, the method of calculation, the target indicator, data sources and data providers are presented. In line with the implementation periods specified in the Roadmap for the implementation of the Roadmap measures, the monitoring indicators have data reporting periods and deadlines for data submission.

An example of a prototype of the tool for monitoring the implementation of the Roadmap measures is available at the following link: Prototype for the monitoring of the Roadmap

The summarized monitoring results are planned to be presented on the Roadmap page: https://statybininkai.lt/lt/buildupskillslt2030-kelrodzio-stebesena

The prototype for monitoring the Roadmap is divided into four main folders, containing indicators for monitoring measures in groups A, B, C and D. The structure of the prototype for monitoring the Roadmap is presented in Figure 8.2.



2. ...e ...monitoring of the Roadmap measures.

The first part of the table of monitoring indicators (columns 1 to 9) contains the monitoring indicators, the units of measurement of the indicators, the method of data collection and/or calculation, the sources of data, the target value of the indicator, the data providers, the periodicity of the calculation of the indicator or the reporting period. The table includes a comments column to provide information on the availability of the actual indicator values, a reference to the legislation that has been prepared, and the method of determining the indicator values. Instructions for the presentation of the data in columns 1 to 9 of the table are given in Table 8.1.

The second part of the monitoring indicators table (columns 10 to 25) provides information on the status of the measure (completed/ongoing), with the status value selected from a drop-down menu. The target values for the indicator (RPL) are given in columns 11 to 17. Actual indicator values (RF) are shown in columns 18 to 24. Column 25 shows the calculated percentage of achievement of the actual indicators (S), calculated as a percentage of the target value or of the aggregated values (no input required, calculated automatically). Instructions on how to present the data in columns 10 to 25 of the table are given in Table 8.2.

Table 8.1. Instructions for completing the monitoring table for the implementation of the Roadmap measures (columns 1 to 9).

No	Monitoring indicator name	Units of measurement	Method for data collection/calculation	Data sources	Achievement indicator for the target	Data providers	Regularity of calculation of the indicator value or reporting period	Comment on the availability of actual indicator value
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
1	*Indicate the code and title of the group of measures (e.g. "A. CREATING LEARNING LEARNING IN THE MARKET")*							
1.1.	*Indicate the sub-group of measures and the title (e.g. "A01. Develop and implement a methodology for calculating and assessing CO2 thresholds in projects")*							
1.1.1.	*Provide the title of the indicator (e.g. "Methodology for calculating and assessing CO2 thresholds in projects in place")*	*Indicate the units of measurement (e.g. 'one legal act prepared and approved by order of the Minister for the Environment')*	*Indicate the method of data collection and/or calculation (e.g. "Survey, Data transfer, Percentage calculation")*	*Indicate primary and secondary data sources (e.g. Primary source: Ministry of the Environment; Secondary source: Legal acts database https://e-seimas.lrs.lt/)*	*Indication of when the indicator is considered achieved (e.g. "The indicator is considered achieved when the legal act approving the application of the methodology has been prepared and approved by order of the Minister of Environment")*	*Indicate data providers (e.g. "Ministry of the Environment")*	*Indicate the regularity of the calculation of the indicator value or the reporting period (e.g. "Data to be reported in Q1 2028 for calendar years 2026 and 2027")*	*Provide comments on the availability of the actual values of the indicator, refer to the legislation issued, and indicate the method used to determine the values of the indicator (e.g. " A comparative analysis is carried out by calculating the percentage of the aggregated actual indicators in relation to the aggregated target indicators")*

Table 8.2. Instructions for completing the monitoring table for the Roadmap measures (columns 10 to 25).

Status of implementation of the measure (completed / ongoing)	Target values for the indicator (R_{PL})							Actual indicator values (R_F)							Assessment of indicator achievement (% of target value)
	2024	2025	2026	2027	2028	2029	**2030**	2024	2025	2026	2027	2028	2029	**2030**	
10	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
	The <u>planned</u> implementation values of the measure are given in the column for the relevant year, with a numerical value (e.g. if the measure is planned to produce one document between 2026 and 2027, the number 1 is entered in the column for 2027)							*The <u>actual</u> implementation values of the measure for the relevant year are given in the column providing the numerical value*							*Percentage of actual indicators achieved (no need to enter, calculated automatically)*
Indicate the implementation status of the measure by selecting "Implemented" or "Ongoing" from the drop-down list	-	-	-	1	-	-	-	-	-	-	1	-	-	-	100.00%

The percentage of actual indicators achieved is calculated according to the following formula:

$$S = \sum_{t_1}^{t_n} R_{PL} \,/ \sum_{t_1}^{t_n} R_F \times 100$$

here S - percentage achieved value of actual indicators, %; R_{PL} – target values for indicators, units., %.; R_F – actual values of indicators, units, %; $t_1 - t_n$ – period for reporting indicator values, year.

9. Conclusions and Recommendations

Considering the goals of the Roadmap and the measures formulated, we present an outline of conclusions and recommendations divided into four main categories of measures.

A. Generating a demand for training on the market

Factoring in the shifting needs of the construction sector calls for a multifaceted approach. Initiatives such as the development of methodologies for CO2 assessment (A01) and the establishment of systems of subsidies for sustainable construction (A02) are critical when it comes to setting up benchmark standards and incentives.

Reconsidering the methodologies of building renovation (A03) aims to improve the efficiency of energy use, bringing up to a higher standard, thus promoting more environment-friendly building construction and renovation. With dynamic energy modelling included into the processes of BIM project implementation as grounds for energy efficiency certification (A04) and data made more accessible to the concerned parties in the construction sector (A05), decisions could be made in reliance on the latest and most accurate information.

Creating an electronic register for the general indicators of buildings (A06) will lead to standardised data collection, improving transparency and accountability. Endorsing digital BIM models as an official part of the digital documentation of projects (A07) will become a key step towards transformation into complete digitalisation, ensuring that projects are developed, carried out, and supervised using the best state-of-the-art tools available. Establishing sets rules for the assessment of compliance of BIM information containers (models) to be used in automated project evaluation will allow optimising and simplifying the procedure of project reviews for the purposes of issuing construction permits, and will make this procedure more transparent.

A unified building maintenance standard (A09), when available, will fill in the existing gap in the transmission of BLC data from the construction phase to the operation and maintenance phase. And the open system for rating the parameters of the quality of building operation (A10) will create new possibilities to begin rating the parameters of the quality of building operation, in addition to those that are quantitative in nature. Data compiled in doing so can then be used by clients and designers to plan new solutions and pick the appropriate technology.

The new pilot (demo) project programme (A11) will enable implementing joint projects by business, research, and governmental institutions, testing them on the market, analysing them, and efficiently deploying the resultant solutions on the market. Improving the criteria of economic performance coupled with project objectives (A12) will guarantee ongoing growth of the sector and the promotion of developing competences on the market. This will allow boosting the efficiency, transparency, and quality of projects being implemented (the projects will be implemented within their timeframe and budget). Continuous development of the SKST BIM methodology through integration into international networks by marshalling the resources of business, academia, and the state, integrating the methodology into the outcomes of the BIM LT project will ensure a steady increase in the level of digitalisation of the construction sector, optimise coordination, guarantee rational application of budget allocations for the shared activities of all the parties involved without any activity overlaps, and will drive exports.

The measure of obligatory transfers of 0.25% of salaries to a training fund (A14) following the example of EU states will ensure a stable minimum flow of funding to satisfy the constant demands for upskilling in the sector. The measure of open tests to self-assess one’s knowledge, identify areas for improvement, and set goals (A16), to be applied on a pilot basis, by anonymising the information and

collecting it on an aggregate basis only and in combination with A14 and other measures, will make it possible to identify the market needs and to plan the necessary trainings better.

The existing demographic situation and the potential shortage of skilled labour in the sector pose big challenges for the construction sector. The measure to engage young people in the sector (A15) is expected to address the soaring problem of the sector's ageing and to improve the visibility and prestige of the sector. In light of the fact that right now we have a very low percentage of women's involvement in the activities in the construction sector, it is clear that we have a vast untapped potential on our hands. With the construction sector becoming increasingly automated and efficient, the amount of hard and difficult labour at the construction site will potentially shrink. To that end, aiming to make the construction sector more appealing to women, a measure (A17) has been devised to encourage women to join in in the development of the construction sector.

B. Ongoing and formal upskilling

Considering the ongoing changes and challenges in formulating ambitious goals of energy efficiency and sustainability, the existing professional standards in the construction sector merit an upgrade (B01), in line with the development and introduction of new professional standards of electrician, which are currently missing (B02). These are the main measures that can ensure, in a structured manner, that workforce have the necessary skills and knowledge. It is critical to create a flexible mechanism connected to the development of curricula that would be able to respond to the marked needs quickly.

Routine updates to the curricula for the public purchasing bodies (B03) and architects/engineers (B04) help ensure that specialists are well aware of the latest practices of sustainability, energy efficiency, and digitalisation. For construction workers to be able to keep up with technological advancement, they need to be offered revised informal curricula (B05). In the same vein, updating formal curricula (B06) based on revised professional standards will ensure that new participants in this field will be able to make a contribution with their appropriate skills without delay.

Training informal educators (B07) will maintain their knowledge at the level of market evolvement. Training of client representatives involved in project planning, procurement, design and construction processes, and transfers of built properties to the operation phase (B08) will allow effectively integrating one of the key stakeholders into the chain of the construction lifecycle. Training non-engineering personnel of contractors (B09) will improve the efficiency of project management aiming to effectively achieve the goals in place. Organising informal training for architects and design and construction engineers and workers of all levels (B10 and B11) will create an opportunity to confer knowledge about new objectives and products and technologies in the pipeline to the critical mass of the existing workforce on the market in a structured fashion. Today, building operation and maintenance engineers and workers have very fragmented access to training on the market, with no training available in some areas at all. Measures B12, B13, and B14 are designed to create a new, integrated process of BLC project management, a system of training operation and maintenance engineers and workers of all levels that is oriented towards new goals and objectives. The system of training operation and maintenance specialists and workers is to be integrated in the currently up and running and upgradable STATREG.lt system of the register of construction competences.

C. Evaluation, recognition, and certification of competences

The reform of the certification systems for architects (C01) and construction engineers (C02) aims to reflect the updated professional standards and methodologies just as it ensures that practitioners are recognised for their available competences, promoting their ongoing development. Upgrading the certification system for energy efficiency and sustainability experts (C03) is in line with the sector's increasing focus on sustainable practices. Once upgraded, the construction information classification system (C04) will provide for easier documentation and execution. The enactment and expansion of

the STATREG system (C05) for the management of competences across the sector will improve workforce mobility and the quality of project implementation, offering an opportunity to manage occupational safety processes and organise the control of illegal labour better. Setting up a competences evaluation centre (C06) will allow centralising the process and elevating it to a next level, ensuring consistency and adherence to high standards. Once the new professional standard of electrician is produced and approved, the existing certification framework for energy workers (C07) should be overhauled as well. It is equally important to integrate electrician qualifications in the upgradable STATREG system, considering the possibility of and the need for launching an electrician's e-card.

D. Ensuring follow-ups on the measure plan and the goals

The expansion of the LSA's Qualifications and Competences Committee (D01) will create a structural regulatory mechanism for continuous assessment and adjustment of the implementation of the action plan. By turning SKST into a full-fledged member of the buildingSMART alliance (D02), Lithuania will integrate itself even deeper in the global digital construction community, promoting the exchange of knowledge and the application of standards. This will also create an opportunity to consolidate shared OpenBIM solutions, to be co-developed with an international team without overlapping the activities.

Host awards such as For Cohesive Development (D03) and Best BIM Projects in Lithuania (D04), as well as annual international conferences Digital Construction. Vilnius (D05), which will foster a culture of continued upskilling and innovation, driving the sector to keep raising the bar and adopt good practices. Exchange of knowledge and practices of Lithuanian and international project teams will improve the overall efficiency of the market, promote competition, and drive exports.

These recommendations are presented with an aim of ensuring a holistic approach to upskilling, certification of competences, and continued training in the construction sector, which is geared towards tackling the challenges of sustainability, energy efficiency, and digitalisation head-on. Implementing these measures calls for cooperation of various stakeholders, such as government bodies, municipalities, professional associations, and education establishments, clearly focusing on adapting to and predicting the future sector demands and implementing the action plan.

10. Approvals, support for the implementation of the roadmap

This section provides a link to the list of organizations supporting the implementation of the roadmap action plan developed during the project. The complete list is available on the project's website: https://statybininkai.lt/lt/buildupskillslt2030-kelrodi-palaikancios-organizacijos

All market participants, who see their connection and needs related to the development of competences in the construction sector, are invited to join this initiative by filling out and signing the "Approval, support for the BuildUpSkillsLT2030 initiative" form. The Roadmap support form template can be found on the Roadmap website: https://statybininkai.lt/lt/buildupskillslt2030-roadmap