BUILD UP Skills – Austria
National Roadmap 2030

Report

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Further information

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Foreword

The question of what measures are required to achieve climate neutrality in the building sector formed the core of the "Reboot BUILD UP Skills Austria" (ReBUSk) project. In this context, the focus was directed toward developing an education and training roadmap extending to 2030 that was in line with meeting national and European climate targets. The aim is to ensure that the skills needed in a climate-neutral building sector are available by the end of the current decade.

This roadmap was developed under the leadership of the Austrian Energy Agency by an interdisciplinary project consortium consisting of the University for Continuing Education Krems (Department for Building and Environment), the Styrian Energy Agency, the Austrian Institute for Vocational Education and Training Research, and the Graz University of Technology.

The consortium's main task was to identify the skills that will be required to overcome the challenges that lie ahead and to show how these can be most effectively integrated into Austria's diverse education and training landscape.

Based on regular and joint discussions with stakeholders from various educational institutions, professional associations, and other organisations and on the status quo analysis[1] carried out in the project, this roadmap covers a total of five strategic fields of action. These provide the framework for measures that must be implemented to achieve a climate-neutral building stock. As of March 18, 2024, more than 65 relevant Austrian organisations have expressed their support for the implementation of these measures.

This roadmap shows which educational and training measures will significantly support the building sector as society moves towards a climate-neutral future.

[1] See https://doi.org/10.48341/q71c-g758, accessed on 07.03.2024

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1 Executive summary

As part of the "ReBUSk" (Reboot BUILD UP Skills Austria) project initiative, a national continuing education and training roadmap up to 2030 was developed in consultation with relevant stakeholders from three key areas – education, business and politics – with the aim to achieve Austria's energy and climate targets in the building sector. The roadmap emphasises five strategic fields of action, identified through a comprehensive status quo analysis and a subsequent SWOT analysis. These five fields of action address existing gaps and barriers in training and continuing education regarding meeting the energy and climate targets in the building sector and highlight measures to overcome these.

The five strategic fields of action include:

1. **Addressing new target groups with educational offers:** The first strategic field of action specifically addresses decision-makers and stakeholders in the building sector. In addition to stakeholders in the areas of planning and construction, representatives from the real estate industry, building management and building operations are also addressed. A particular focus is placed on raising awareness among users and private property owners. The aim is to promote innovative and sustainable practices in the sector through targeted awareness-raising and skills development measures as well as needs-based continuing education and training programmes. The low proportion of women in the building sector will be addressed by creating attractive framework conditions and targeting girls and women in continuing education and training in an effort to replace traditional role models and jointly bring about positive changes in building performance.

2. **Integration of climate science skills in continuing education and training:** The second strategic field of action involves directly addressing skills gaps in continuing education and training, and particularly in the area of increasing resource efficiency and recyclability, as well as developing skills that allow high-quality building renovation and decarbonisation of the building stock. The aim is to comprehensively empower professionals so they can apply effective measures that support the sustainable design of construction projects and thus subsequently increase the renovation rate. The further development of curricula and syllabuses as well as the development of a competence model play a central role in meeting both current and future requirements for sustainable construction.

3. **Promotion of participation in continuing education offers:** This strategic field of action increases participation in continuing education programmes in the spirit of lifelong learning. Particular attention is paid to in-company continuing education and the promotion of relevant skills, for example, those that support an increase in circularity and resource efficiency as well as the comprehensive renovation and decarbonisation of the building stock. Targeted, specific continuing education measures are intended to ensure that skilled workers are continuously upskilled or

receive further qualifications with regard to the use of current and future methods and technologies.

4. **Improvement of the interface between planning and execution:** Action area four aims to improve the interface between planning and implementation, thus increasing communication and cross-trade cooperation between the actors involved in planning and implementation. Appropriate measures should ensure consistent quality and a seamless connection between the two phases. This field of action is of crucial importance to ensure the efficient and damage-free implementation of energy-efficient and sustainable technologies.

5. **Enhancement of vocational training and skilled trades:** Making apprenticeships and skilled trades in the building sector more attractive is the fifth strategic field of action, which emphasises the creation of favourable framework conditions, individual career paths and quality-enhancing structures. This field of action was chosen to increase the attractiveness of apprenticeships and skilled trades in the construction industry to attract more new skilled workers who will support the sustainable reModeling of the building sector and to encourage them to remain in the industry.

Figure 1: Strategic fields of action on the Austrian education and training roadmap

Specific measures were developed for these five strategic fields of action, which are presented in detail from chapter 4 and onwards in this roadmap. The measures developed are intended to serve as a guide for the further development of continuing education and training for the Austrian building sector. The following table provides an overview of the measures developed in the individual fields of action.

Table 1: Overview of strategic fields of action and measures

1	Providing education offers for new target groups	
1A	Developing and increasing expertise in climate science in the real estate industry, property and facility management areas	Chapter 4.1

1B	Providing specific continuing education and training offers for women in the building sector	Chapter 4.2
1C	Addressing users and private property owners	Chapter 4.3

2	Integrating climate science competences in training and continuing education	
2A	Anchoring climate science competences in formal education (NQR[2] 4 and 5)	Chapter 5.1
2B	More strongly anchoring climate science competences in the continuing education programmes coordinated by the sponsors (master craftsman, foreman, and building trade schools; NQF 6/without allocation)	Chapter 5.2
2C	More strongly anchoring climate science competences in the curricula of bachelor's and master's degree programmes in the building sector (NQF 6 and 7)	Chapter 5.3
2D	More strongly anchoring climate science competences in the curricula of scientific continuing education programmes in the building sector (NQF 6, 7, 8)	Chapter 5.4
2E	More strongly anchoring climate science competences in the educational programmes of non-formal continuing education providers in the building sector	Chapter 5.5
2F	Developing a competence model for the climate-neutral building sector	Chapter 5.6

3	Promoting participation in continuing education offers	
3A	Continuing education on the construction site	Chapter 6.1
3B	Anchoring of continuing education in collective agreements in the construction industry	Chapter 6.2
3C	Quality assurance of training and continuing education content - active exchange between education, science, and practice	Chapter 6.3
3D	Qualification network: Decarbonised and recyclable building stock	Chapter 6.4
3E	Tailoring in-service training and continuing education programmes in response to participants‘ individual circumstances	Chapter 6.5
3F	Promotion of internal knowledge transfer	Chapter 6.6

4	Improving the interface between planning and execution	
4A	Funding programme to establish a "sustainability interpreter" at the interface between planning and execution	Chapter 7.1
4B	Promoting a positive error culture in the construction industry	Chapter 7.2
4C	Quality assurance of construction work with a focus on energy efficiency and sustainability	Chapter 7.3

[2] The National Qualifications Framework (NQF) is an instrument for aligning qualifications with respect to the Austrian education system. This transparency instrument is intended to facilitate orientation in the Austrian education system, on the one hand, and to contribute to the comparability and comprehensibility of national qualifications in Europe, on the other hand. https://www.qualifikationsregister.at/, accessed on 11.01.2024

5	Enhancing vocational education and training and trades	
5A	Improving the image of apprenticeships in the building sector	Chapter 8.1
5B	Strengthening company trainers	Chapter 8.2
5C	Improving working conditions on the construction site	Chapter 8.4
5D	Ensuring the quality of apprenticeship programmes through systematic quality management	Chapter 8.5
5E	Developing and establishing new career paths after completing an apprenticeship	Chapter 8.6

Relevant strategic fields of action beyond the system boundary

Due to the high complexity of the Austrian education and training system, it was necessary to define system boundaries as part of this project. Consequently, this national education and training roadmap emphasises measures developed for specific occupational profiles and trainings directly related to buildings, but does not provide detailed descriptions of the broader strategic fields of action that exist at a systemic level but are no less relevant for the holistic development of the building sector.

The following two broader strategic fields of action, therefore, should be emphasised. These were actively discussed in talks with stakeholders throughout the course of the project and heavily influence the overall success of the project initiative and the achievement of Austria's energy and climate targets:

- Increasing the sustainability awareness of the entire population by developing specific measures from primary school education and onwards and of decision-makers in the public and private sectors. In this context, reference should be made to the already well-established national climate protection initiative "klima**aktiv**" (BMK, 2023) of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK).
- Necessary strategic coordination of measures between regions, federal states, the federal government, and the Public Employment Service Austria (AMS). In view of the wide range of measures at various regional levels in Austria, a coordinated approach is needed to ensure the effective utilisation of funding instruments. This point is actively addressed in the current "**Just Transition** - Action Plan for Training and Continuing Education" (Lindinger et al., 2023) of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)[3].

These strategic fields of action illustrate the immense challenge and the far-reaching changes in social thinking and existing structures that are required to ensure the sustainable development of the continuing education and training landscape in the building sector.

[3] Topic Area 3, Framework conditions and compatibility

2 Introduction

Meeting Austria's ambitious climate targets by 2040 will require a drastic reduction in greenhouse gas emissions. The building sector plays a decisive role here. Accounting for around 40% of energy consumption and 36% of greenhouse gas emissions[4] at the EU level, this sector is an important field of action for meeting the energy and climate targets.

Energy consumption in Austria

In Austria, the building sector is responsible for almost one-third of the total energy consumption and 17% of greenhouse gas emissions, not including "grey emissions" from the production of building materials. This puts the building sector in second place behind transport as a source of greenhouse gas emissions. Private households pose a particular challenge, with more than one-third of these still using fossil fuels, primarily oil and gas heating systems.

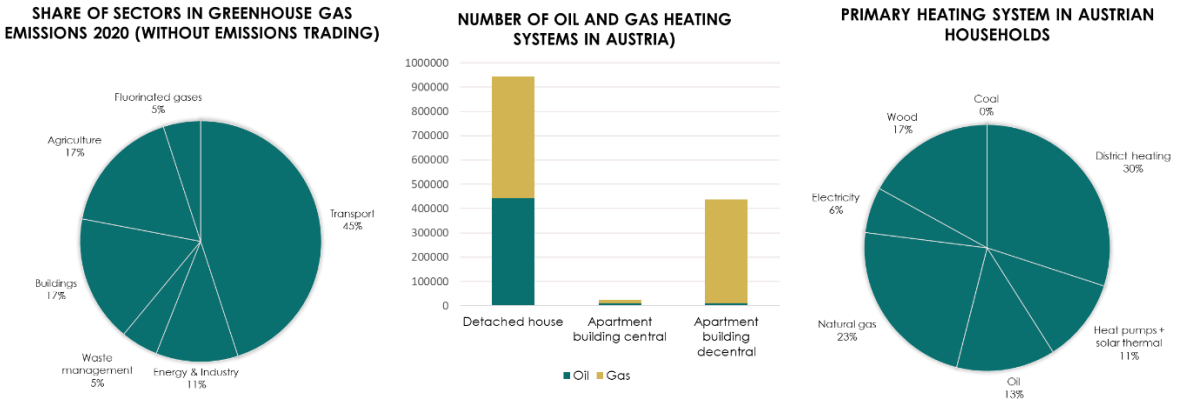

Figure 2: Single-family house energy consumption in Austria. Source: Personal figure based on data from the Environment Agency Austria (Umweltbundesamt, 2021) and Anderl et al. (2022)

Thanks to successful efforts to increase energy efficiency and promote the use of renewable energies, emissions in the building sector have fallen by 36 % since 1990. However, population growth, increased living space per capita and steadily rising comfort needs have led to a stagnation in recent years rather than the desired reduction in emissions (Anderl et al., 2022). Due to the large stock of buildings in a condition that would allow thermal energy improvements and the continued high number of fossil-fuelled heating systems, increasing the renovation rate offers considerable potential for reducing greenhouse gas emissions. In this context, the focus is shifting to planning and cross-trade cooperation in the building sector as well as to optimised qualifications for skilled labour.

[4] Global Status Report for Buildings and Construction 2022 https://globalabc.org/sites/default/files/2022-11/FULL%20REPORT_2022%20Buildings-GSR_1.pdf, accessed on 11.01.2024

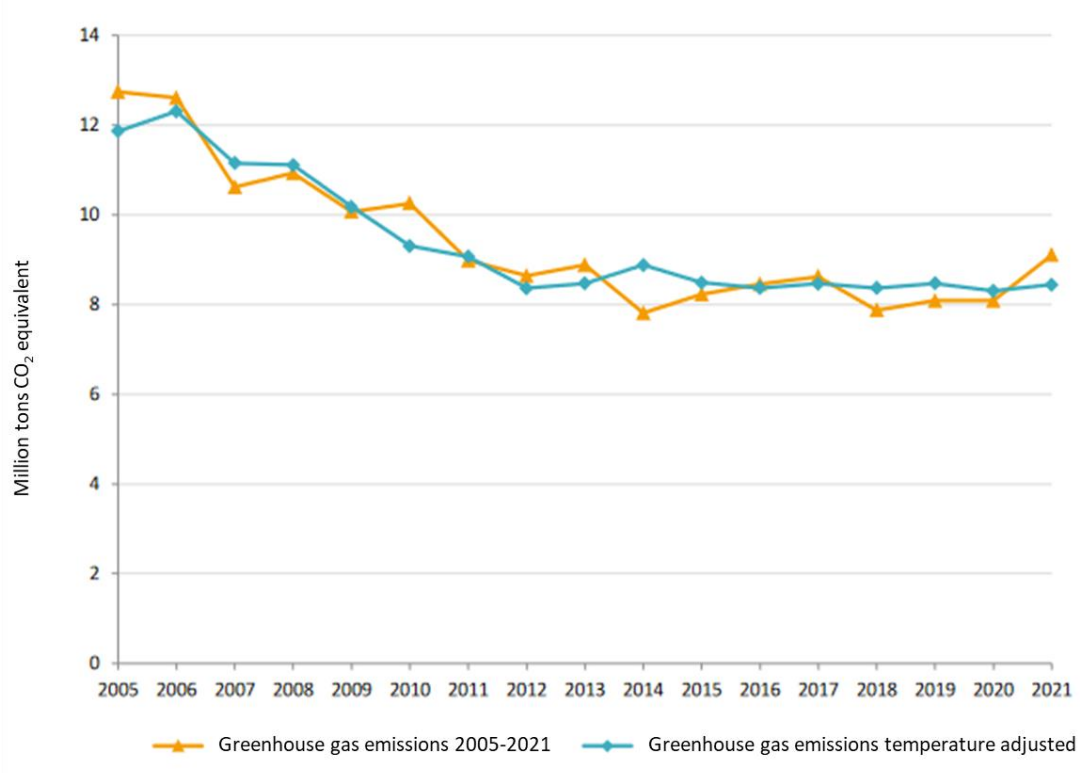

Figure 3: Greenhouse gas emissions from the building sector (Fortschrittsbericht 2023 nach § 6 Klimaschutzgesetz, 2023)

Reboot Build UP Skills

The "BUILD UP Skills" initiative has enabled the European Commission to focus on the qualification of construction professionals since 2011. Based on a comprehensive analysis of the national status quo, the "Reboot BUILD UP Skills Austria (ReBUSk)" project aims to develop a roadmap for qualification in the building sector, contributing to the effort to achieve climate-neutrality in Austria by 2030. The focus is not only directed towards skilled tradespeople, but also includes people in all professional areas involved in planning and completing new buildings and renovations. The aim is to develop a national continuing education and training roadmap that extends to 2030 and is in alignment with both the European climate protection targets up to 2050 and the national climate protection targets up to 2040.

Austrian energy and climate targets

In December 2019, Austria presented its "Long-Term Strategy 2050", which commits the country to achieving climate-neutrality by 2050 without relying on nuclear energy. At the same time, the National Energy and Climate Plan (NEKP) was drawn up, which outlines the strategy to reduce greenhouse gas emissions by at least 36% by 2030 as compared to 2005. Specific targets in the building sector include a reduction in greenhouse gas emissions by 3 million tonnes of CO_2 equivalents as compared to 2016 and the expansion of district heating networks. Austria's energy policy is even striving to achieve climate-neutrality by 2040 (Ipser, Christina et al., 2023).

The legal framework for these targets is described in the Climate Protection Act (KSG) and the Energy Efficiency Act (EEffG). While the KSG is the legal framework for national and European climate targets and is currently being revised or has not yet been adopted, the EEffG regulates the implementation of energy policy and promotes energy efficiency measures, and especially in the building sector. Numerous initiatives such as "klima**aktiv**" (BMK, 2023) and the "**e5 programme**[5]" support efforts to meet these climate targets (Ipser, Christina et al., 2023).

Areas of expertise and target groups addressed

To meet the energy and climate targets, it is essential to ensure that all the necessary competences needed to plan, build and operate climate-neutral buildings are available. As part of the "ReBUSk" project, therefore, relevant areas of expertise were defined and addressed in the Austrian education system using a competence analysis as part of a comprehensive status quo analysis. Thus, closing identified gaps in education and training by means of suitable strategies and measures is a key element of the continuing education and training roadmap developed here.

The competences addressed can be summarised in the following overarching areas of competence:

1. Competences needed to increase energy efficiency and the use of renewable energies in the building sector and to establish zero-emission buildings.
2. Competences needed to increase the renovation rate and decarbonisation of the building stock.
3. Competences needed to increase resource efficiency and recyclability in the building sector.

In the next step, these areas of expertise were broken down more precisely for further investigation (Table 2) to meet the challenges associated with climate-neutral construction.

[5] https://www.e5-gemeinden.at/e5-programm/das-e5-programm, accessed on 19.12.2023

Table 2: Illustration of relevant competences for meeting the energy and climate targets in the building sector (Source: Personal illustration based on specifications in the template provided for the status quo analysis) [6]

(1) Competences needed to enhance energy efficiency and utilise renewable energies in the building sector, as well as establish zero-emission buildings	(2) Competences needed to increase the renovation rate and decarbonise the building stock	(3) Competences needed to enhance resource efficiency and circularity in the building sector
Competences needed to implement measures to increase energy efficiency and utilize renewable energies in buildings	Competences needed to conduct comprehensive building renovations, including through modular and industrialised solutions	Competences to consider and optimise greenhouse gas emissions throughout the entire lifecycle of buildings (by assessing the greenhouse gas potential)
Competences needed for new and existing Nearly Zero-Energy Buildings (nZEBs) and bridging the gap towards Zero-Emissions Buildings (ZEBs)	Competences needed for installers to optimise or renew heating and cooling systems as part of renovation projects	Competences related to circular construction and resource efficiency, including the use of sustainable building materials
Competences needed to integrate renewable energies and efficient heating and cooling technologies, particularly in the deployment of heat pumps	Competences needed for the thermal and energy renovation of historical (listed) buildings	Competences needed for utilising the Level(s) framework
Digital competences to support improved energy efficiency of buildings, especially through increased utilisation of Building Information Modeling (BIM)		
Competences needed to enhance the "intelligence" of buildings to improve overall energy efficiency, grid services, and user comfort (based on the "Smart Readiness Indicator"), particularly in terms of building automation and energy management systems		

Special attention was paid not only to the so-called "blue-collar professionals", but also to the "white-collar professionals", including architects, planners, engineers and building managers. Against the backdrop of energy and climate targets, the study took into account the requirements for all those involved along the value chain in the building sector.

Skilled labour in the Austrian building sector and qualification requirements (status quo analysis)

A comprehensive status quo analysis carried out as part of the project identified 70 occupational profiles that contribute directly to achieving the energy and climate targets in the building sector. The

[6] BUILD UP Skills template roadmap_v1.1.doc, provided by CINEA (European Commission, European Climate, Infrastructure and Environment Executive Agency), Unit D1 - LIFE Energy + LIFE Climate on 16 November 2022

construction sector is largely dominated by small businesses, with around half of the employees working in companies with fewer than 50 employees (see

Table 3).[7]

Table 3: Construction industry statistics by company size

Company size classification by number of employees	Number of companies	Number of companies in %	Number of employees	Number of employees in %
0 to 9	10.587	88 %	13.504	18 %
10 to 49	1.102	9 %	22.991	31 %
50 to 249	239	2 %	23.336	31 %
> 250	35	0,3 %	15.385	20 %
Total	**11.963** NA		**75.216** NA	

Source: WKO industry statistics: Construction 2022, personal calculations. Size classification without marginally employed persons. The differences in the totals compared to the previous table are not comprehensible in the WKO industry statistics.

In 2022, around 305,000 non-self-employed people were active in the construction industry. These people were active mainly in the areas of building construction, electrical installation, gas, water, heating, ventilation and air conditioning installation, roofing and carpentry, road construction, painting and glazing (AMS, 2022). Their educational qualifications vary, with 57% having completed an apprenticeship. Women are severely underrepresented in the construction industry, representing only 13% of employees in 2021 (see Table 4).[8]

Table 4: Employment statistics in construction by socio-demographic factors

Gender, age, nationality and highest educational level	Employees	Percentage
Male	280.582	87 %
Female	43.312	13 %
15 to 24 years	48.704	15 %
25 to 34 years	74.014	23 %
35 to 44 years	74.228	23 %
45 to 54 years	79.506	25 %
55 to 64 years	45.443	14 %
> 65 years	1.998	1 %
Austrian citizenship	250.487	77 %
Non-Austrian citizenship	73.406	23 %
Compulsory school	51.060	16 %
Apprenticeship diploma (vocational school)	184.402	57 %
Lower secondary school (without vocational school)	24.691	8 %
Upper secondary school or higher	46.390	14 %

[7] Source: WKO industry statistics: Construction 2022, personal calculations. Size classification without marginally employed persons.
[8] Source: Microcensus Labour Force Survey annual data. Retrieved from STATcube - Statistical Database of Statistics Austria on 01/02/2023, economic sector ÖNACE 2008

Source: Microcensus labour force survey annual data 2021, retrieved from STATcube - Statistical Database of Statistics Austria on 01/02/2023, economic activity ÖNACE 2008(AMS, 2022) (AMS, 2022)

The findings from the status quo analysis clearly indicate that, despite this diversity, the existing educational systems are facing challenges. In particular, a shortage of skilled labour is observed regarding skilled trades and electrical and building services engineering. Vacancies in the construction sector totalled 8,595 at the end of October 2022 (AMS, 2022), with bottlenecks particularly evident in the planning and construction of photovoltaic systems. There is a need for qualifications at all NQF levels[9] in the areas of competence of comprehensive building renovation, decarbonisation of the energy supply and the circular economy. While skills relating to energy efficiency and renewable energies are firmly established in the education sectors, there is a need for competence development in areas related to building life cycles, such as the optimisation of greenhouse gas emissions throughout the building life cycle and the practice of circular construction. Key starting points are encouraging more participation in continuing education and addressing specific target groups with continuing education and training programmes, which will help to meet the energy and climate targets with the support of qualified specialists (Ipser, Christina et al., 2023).

This roadmap has been developed to close the identified training and continuing education gaps in the building sector. Based on the results of the status quo analysis, key strengths, weaknesses, opportunities, and threats in the building sector were analysed (SWOT analysis). Results of this analysis enabled us to derive key topics and a variety of possible strategies that could be applied to optimise the training and continuing education landscape in the building sector.

By involving key players from the three key areas of education, business, and politics, these strategies were continuously prioritised and refined. Ultimately, five central strategic fields of action crystallised, for which detailed measures were subsequently developed.

1. Addressing new target groups with educational offers
2. Integration of climate-relevant skills in training and continuing education
3. Promotion of participation in continuing educational offers
4. Improvement of the interface between planning and execution
5. Enhancement of vocational training and skilled trades

[9] The National Qualifications Framework (NQF) is an instrument used to categorise qualifications in the Austrian education system. This transparency instrument is intended to facilitate orientation in the Austrian education system, on the one hand, and to contribute to the comparability and comprehensibility of national qualifications in Europe, on the other hand. See https://www.qualifikationsregister.at/, accessed on 11.01.2024

After a brief methodological presentation that outlines how the present training and continuing education roadmap was created, this structure is taken up again, and these five central strategic fields of action are considered in detail.

3 The path to the roadmap

Figure 4: Methodology for the development of the Austrian continuing education and training roadmap

From October 2022 to March 2024, the "Reboot BUILD Up Skills Austria (ReBUSk)" project went through several key phases to develop the national training and continuing education roadmap 2030. Starting with the involvement of as many relevant stakeholders as possible via a qualification platform, a detailed status quo analysis and a subsequent SWOT analysis were carried out. The insights gained formed the basis for the development of the national continuing education and training education and training roadmap, which was finalised through additional continuous stakeholder involvement.

Qualification platform

In order to initiate a national strategy process, the national skills platform created in the first phase of the BUILD UP Skills initiative (2011-2013) was relaunched. This platform primarily brings together all national interest groups with a vested interest in the topic. Further details about stakeholder involvement as part of the "ReBUSk" project can be found under "Roadmap development and stakeholder involvement" and "Accompanying endorsement process".

Status quo analysis

A detailed status quo analysis was then prepared as the basis for the development of the national roadmap. This provides information about the current energy policy situation and the applicable legal and political framework conditions. In addition, it sheds light on the status of training and continuing education and presents an evaluation of the progress that has occurred in the national roadmap up to 2020. This roadmap preceded the "ReBUSk" project, and a particular focus was placed on identifying skills gaps and qualification deficits in the building sector. Barriers and opportunities that could affect whether and how the energy and climate targets can be met were also analysed. The detailed presentation of this background information about the roadmap can be found in the status quo report:

Ipser, C., Altmann-Mavaddat, N., Bruner-Lienhart, S., Ebner, A., Frick, D., Geissler, S., Gugitscher, K., Lachmayr, N., Mayerl, M., Pacher, C., Radinger, G., Rieger, K., Sibille, E., & Trnka, G. (2023). BUILD UP Skills – Austria: Analysis on the National Status Quo. Education and Training for Achieving the Energy and Climate Targets in the Austrian Building Sector. [BUILD

UP Skills Report]. Department for Building and Environment, University for Continuing Education Krems. https://doi.org/10.48341/3P36-RB65

SWOT analysis

As part of a SWOT analysis, strengths, weaknesses, opportunities, and threats were identified in association with the status quo of the building sector. These are related to the qualification of skilled workers and could either promote or hinder efforts to meet the energy and climate targets. The most important topics were first identified in team workshops. The basis for this identification was the energy policy and legal framework conditions described in the status quo analysis, the current continuing education and training situation and the results of evaluating the first national roadmap up to 2020. The results of workshops held with experts, practitioners and stakeholders from the construction and real estate industries, as well as areas of continuing education and training and labour market research, were also incorporated into the overall assessment.

The project consortium first collected strengths and weaknesses (influencing factors within the system under consideration), as well as opportunities and risks (external influencing factors and developments in the system under consideration), for the building sector in a tabular template. Over two hundred entries were created. These were then grouped and sorted thematically in team workshops. This made it possible to identify key topics related to potential barriers and opportunities.

Possible strategies were then developed for each identified topic area by comparing strengths and weaknesses, on the one hand, with opportunities and risks, on the other. As a result of this process, 53 strategies were derived, which were prioritised in an online survey completed by stakeholders. Based on the results of this survey, five specific fields of action for meeting the energy and climate targets were defined, and concrete measures developed.

Figure 5: Work steps as part of the SWOT analysis

Roadmap development and stakeholder involvement

Under the title "From visions to actions: Developing concrete measures for the national education and training roadmap in the building sector by 2030", an expert workshop was held on 17 October 2023. Representatives from the fields of education and research, non-profit organisations, business organisations, professional associations and experts from the construction and architecture sectors took part in this workshop, which was held in collaboration with "Renowave" (an innovation laboratory for climate-neutral building and neighbourhood renovation in Austria). Measures were developed for strategies that were categorised as important in the online stakeholder survey: "Addressing new target groups with training courses", "Promoting participation in continuing education courses", "Improving the interface between planning and execution" and "Improving the attractiveness of apprenticeships and skilled trades".

The results obtained formed the substantive basis for the consortium's development work in drawing up the preliminary national continuing education and training roadmap. Stakeholders were involved in the finalisation process through further bilateral discussions. It became clear that initiatives already exist for many of the measures developed as part of the continuing education and training roadmap. These serve as important starting points for the implementation of the measures and are regarded as significant points of reference[10].

Another key point of reference for the "ReBUSk" project is the "**Just Transition** - Action Plan for Education and Training" (Lindinger et al., 2023) of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). This action plan describes specific measures for continuing education and training in the energy and heating sector that can help to prepare workers to meet the new requirements and enter professional fields resulting from the transition to a climate-friendly economy. This action plan, therefore, complements the roadmap and shows clear overlaps in some areas.

In addition, reference should be made to the klima**aktiv** initiative(BMK, 2023) and, as part of this, to the klima**aktiv** building standard, which is an assessment system for buildings in Austria. This standard was designed to improve the energy efficiency and environmental compatibility of new buildings and renovations by defining criteria for various aspects, such as energy efficiency, indoor air quality, the use of renewable energy and environmentally friendly building materials. Buildings that meet this standard are considered to be future-proof and sustainable. In addition, the klima**aktiv** initiative also offers advisory services, quality inspections for sustainable construction and renovation as well as practice-oriented continuing education and training opportunities in this area.

The last step to finalise the national continuing education and training roadmap was taken on 4 March 2024 at the FAKTory in Vienna. A final event entitled "Climate-smart building experts shape the future: A national continuing education and training roadmap for Austria - from vision to implementation" took place there. This event included a presentation of the

[10] It should be noted that not all initiatives are explicitly mentioned in this document, as this is outside the scope of the project.

project results and discussions on how the continuing education and training roadmap would be implemented in the future.

Accompanying endorsement process

The process of involving stakeholders (organisation representatives, experts and other actors) in the building sector was crucially important both for developing the content of the national continuing education and training roadmap and for gaining broad support for the successful implementation and promotion of national qualification standards.

Stakeholder involvement began with an analysis of the previous endorsement strategy included in the national continuing education and training Roadmap 2020, which was developed ten years ago (Fechner & Selinger, 2013). This involved identifying the strengths, weaknesses and potential for improvement in measures used to solicit support for the roadmap and its objectives. In addition, the successful endorsement processes of the "Construction Blueprint" project[11] were analysed to derive suitable principles and methodologies from both projects examined as part of further endorsing "ReBUSk".

Stakeholders were involved in content-related issues by using a broad range of methods, such as presentations, interviews and workshops, which allowed various expert opinions and feedback to be collected and assessed. Finally, a first draft version of the national continuing education and training roadmap 2030 and other solution strategies were presented at a final conference. In addition to bilateral contacts and discussions with stakeholders in advance, this conference offered the opportunity to express statements of support for the roadmap. As of 14 March 2024, more than 65 national organisations have expressed their support in writing.

[11] https://constructionblueprint.eu/de/home-de/, accessed on 29.02.2024

4 Action Area 1: Providing education offers for new target groups

The first field of action covers the sustainability and climate relevance of buildings, enabling the entire life cycle of buildings to be examined in more detail. Decision-makers and stakeholders from a wide range of sectors play a crucial role in meeting energy and climate targets in the building sector. This requires raising awareness in specific areas and applying skills development measures as well as customising continuing education and training programmes for all relevant target groups. The status quo analysis clearly indicates that a potential for action exists, and particularly among stakeholders in the real estate industry, building management and building operation areas, as well as among users and private property owners.

We would like to emphasise that special consideration must be given to fulfilling the needs of girls and women when addressing the target group. They are currently severely underrepresented in the building sector. Measures should therefore be developed to specifically promote the participation and involvement of girls and women. In this way, a holistic and diverse approach is preferred to comprehensively meet the challenges in the building sector.

The following section presents specific measures developed to strengthen the skills of decision-makers in the building life cycle, increase the proportion of women in continuing education and training and raise awareness and increase the skills of private individuals.

4.1 Measure 1A: Developing and increasing expertise in climate science in the real estate industry, property and facility management areas

Current situation:

Stakeholders in the property sector, building management and building operation play an important role in the life cycle of buildings. They make and influence decisions that affect the energy performance of building operations, the implementation and quality of renovation measures and the environmental sustainability of buildings. However, teaching content on the topics of building energy efficiency, the use of renewable energies, thermal renovation, decarbonisation of the building stock, resource efficiency and recyclability has so far only been partially anchored in continuing education and training programmes these actors.

The EU Taxonomy Regulation and the reporting obligation for companies in accordance with the CSRD (Corporate Sustainability Reporting Directive) **are intended to promote sustainable investments in the property sector**, among other things**.** To be able to operate sustainably in

the long term, decision-makers in the real estate industry and in property and facility management need basic knowledge of the EU Taxonomy Regulation and the requirements it imposes on the building sector. The EU Taxonomy Regulation offers a decisive incentive to anchor and further develop energy, climate, environmental and resource topics in continuing education and training programmes.

Description of the measure:

Increasing the skills of key stakeholders and decision-makers in the building life cycle in the areas of building energy efficiency, use of renewable energies, thermal renovation, decarbonisation of the building stock, resource efficiency and recyclability by anchoring and expanding relevant teaching content in continuing education and training in for the real estate industry and for the property and facility management sectors, including continuing education and training for professional groups of real estate trustees (real estate agents, property managers and property developers) [12].

Specific objectives of the measure:

Learning content for teaching relevant skills associated with improving the energy efficiency of buildings, the use of renewable energies, thermal renovation and decarbonisation of the building stock, as well as resource efficiency and recyclability in the building sector are firmly anchored in continuing education and training in the real estate industry and in the property and facility management sectors.

Options for action:

- Identification and description of relevant competences and content for the different professional groups and educational levels
- Provision of (quality-assured, regularly updated) teaching and learning materials appropriate to the level and needs
- Provision of "train-the-trainer" programmes
- Development of a quality assurance and incentive system based on the klima**aktiv** competence partnership for the real estate industry and for property and facility management

Key stakeholders for implementing the measure:

- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Industry representatives in the property and asset trustee sector
- Interest groups in the real estate industry, property and facility management sectors

[12] See also Action Area 2, which addresses how climate science skills will be anchored in continuing education and training programmes for the entire building sector.

- Public and private education providers
- Representatives of the wood industry
- …

Timeframe for implementing the measure:

2024-2026

Monitoring indicators:

Increase in the number of continuing education and training courses in the real estate industry and the property and facility management sectors and provide relevant teaching content on the topics of building energy efficiency, use of renewable energies, thermal renovation, resource efficiency and recyclability.

4.2 Measure 1B: Providing specific continuing education and training offers for women in the building sector

Current situation:

The working environment in the construction industry is not considered to be very female-friendly; many professions in the building sector are perceived by society as being "masculine". The existing work culture, the unique position held by women in a predominantly male domain and the (still) prevailing role models mean that the industry is not very attractive to women. Accordingly, the proportion of women in the building sector is low across all occupational groups and in almost all areas of education. (The only exceptions are individual educational programmes, such as planning and administration-related apprenticeships, technical and commercial colleges, or architecture studies.)

In addition to measures that make working conditions in the construction industry more generally attractive and that replace traditional role models and occupational patterns, it is also important to encourage girls and women to enter continuing education and training programmes and to make the framework conditions in these programmes more attractive to them.

Description of the measure:

The measure targets girls and women by offering attractive, gender-sensitive training programmes in the building sector. At the same time, the framework conditions in training and continuing education will be designed such that they are particularly attractive to girls and women. These steps should help to replace traditional gender stereotypes and promote the balanced participation of women in the construction industry.

Specific objectives of the measure:

The proportion of girls and women in continuing education and training programmes in the building sector is being increased by targeted communication campaigns, attractive framework conditions and attractive offers.

Options for action:

- Addressing girls and women as a target group when communicating information about training and continuing education programmes, e.g. by designing information material in gender- and diversity-sensitive ways and by selecting suitable channels.
- Creating attractive training and continuing education programmes, e.g. by taking different life contexts into account when selecting suitable (e.g. flexible) formats, by prioritising content and by considering gender aspects as a cross-cutting topic.
- Creating gender- and diversity-sensitive learning environments, e.g. by promoting a balanced gender ratio and strengthening the gender and diversity competences of instructors and trainers, as well as by investing in the corresponding infrastructure.
- Improving accessibility and creating attractive framework conditions, e.g. by taking gender budgeting approaches to ensure funding and financial security for training and continuing education[13], by creating and subsidising childcare facilities where necessary, ensuring a balanced geographical distribution of educational offers throughout Austria, and adapting curricula to fulfil the needs of individuals with care responsibilities.

Key stakeholders in the implementation of the measure:

- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Public Employment Service (AMS)
- Public and private education providers
- …

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Increase the proportion of women among participants and graduates of training and continuing education programmes in the building sector.

[13] Like the "greenJobs" focus of the AMS programme FiT (Women in Trades and Technology), a special focus could be placed on promoting climate science continuing education and training for the building sector.

4.3 Measure 1C: Addressing users and private property owners

Current situation:

Private individuals play an important role in the life cycle of residential buildings. As users, they have a considerable influence on energy consumption and the efficiency of building operation; as house and flat owners, they decide how energy efficiency and renovation measures are implemented; and as private clients, buyers or tenants of properties, they help determine the demand for energy-efficient and sustainable residential buildings. At the same time, these target groups are not yet sufficiently addressed by coordinated information, advice and training programmes.

Description of the measure:

The measure raises awareness and increases skills among private individuals, such as users, owners, clients, and property buyers or tenants, by supporting the provision of targeted and coordinated information, advice, and training programmes.

Specific objectives of the measure:

Targeted and coordinated information, advice and training programmes are intended to raise awareness and increase the skills of private individuals, such as users, owners, clients and property buyers or tenants.

Options of action:

- Expansion of existing and target group-oriented development of additional awareness-raising, information, advice or continuing education offers and measures for users and tenants, as well as for private owners, clients and buyers of residential properties. The aim is to increase the ability of consumers to promote sustainability in connection with energy efficiency and the energy-efficient use of properties, commissioning consulting and planning services (e.g. preparing a renovation concept or renovation roadmap), maintenance and repair services, and implementing construction and renovation measures (including heating replacement).
- As a basis for this, a survey, compilation, and evaluation of existing offers as well as needs and target group analyses will be carried out.
- Carry out a publicity campaign to reach specific target groups (e.g. private owners, clients, buyers or tenants of residential property) through advertising and the dissemination of information, advice or continuing training offers.
- Further expansion of energy consultations.
- Fundamental information about the energy-efficient use of buildings should be part of basic education and taught from primary school and onwards. This will be supported, for example, by providing target group and age-appropriate teaching and learning materials for school lessons.

Key stakeholders for implementing the measure:

- Energy advice centres of the federal states
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Specialised energy departments of the provincial administration in the federal states
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Increasing the amount of existing information, counselling or continuing education offers for target groups and increasing the number of private individuals reached.

5 Action Area 2: Integrating climate science competences in continuing education and training

The strategic importance of anchoring climate-neutral skills in continuing education and training for the building sector emerged as an essential field of action as a result of the status quo analysis. To this end, currently valid curricula, training regulations, course descriptions, etc. for Austrian continuing education and training programmes were examined for corresponding content.

Important climate science competences were found to be already anchored in the Austrian vocational education system, and particularly in new apprenticeships and recently adapted training regulations and curricula. Clearly, climate science competences are already increasingly being considered in the ongoing development of continuing education and training programmes. Across all areas of vocational education, this especially applies to skills that are needed to increase energy efficiency and the use of renewable energies in buildings, as well as for the consideration and optimisation of greenhouse gas emissions.

In contrast, some of the education programmes in Austria still do not teach enough skills that contribute to increasing resource efficiency, recyclability and the decarbonisation of the building stock (thermal and energy-efficient renovation and implementation of energy management), as well as skills needed to assess the life cycle of greenhouse gas emissions. The education sectors are affected by this in different ways.

The following measures have been developed to close these gaps by anchoring missing or inadequately mapped competences more strongly and transparently in the relevant curricula. They are based on a preliminary analysis of the content of selected continuing education and training programmes with regard to the climate science skills listed in Table 2. Please note that the selected continuing education and training programmes emphasise professions that are clearly connected to buildings and highly relevant for meeting the energy and climate targets. We have selected the ones we consider the most important as examples, but do not consider this list to be exhaustive[14]. In addition, the following measures promote the development of a comprehensive model of climate science competences in the building sector based on competence models that have already been tested in Austria. This development can promote the coherent anchoring of climate science competences in all continuing education and training programmes.

[14] Training regulations, curricula and examination regulations that are not yet in force were not analysed.

5.1 Measure 2A: Anchoring climate science competences in formal education (NQR 4 and 5

Current situation:

As part of the status quo analysis, gaps were identified regarding climate science competences in formal training.

Description of the measure:

Some of the climate science competences are hardly or not at all reflected in selected curricula of formal education and would therefore need to be (more strongly) anchored or their content updated.

Specific objectives of the measure:

The specialised climate science competences are comprehensively anchored in the existing training regulations for relevant apprenticeships and in the curricula of subject-relevant programmes at secondary and higher vocational schools and are thus strengthened.

Options of action:

Relevant curricula of formal training that were subjected to a rough analysis as part of the status quo analysis[15]:

- Training regulations for relevant apprenticeships (Building Waterproofing Technician (2019), Roofing Specialist (2019), Waste Management and Recycling Specialist (2021), Prefabricated House Construction (2017), Construction Specialist (with focus on new construction and renovation) (2019), Wood Technology (2008), Installation and Building Technology (including basic module Building Technology, main module Gas and Sanitary Technology, special modules Ventilation Technology, Eco-energy Technology, Control Technology, and Building Services Engineering) (2008), Sun Protection Technology (2017), Thermal, Cold, Sound, and Fire Protection Technology (2017), Carpentry (2015)), Carpentry Technology (2015/2021)).
- Curricula of Vocational Middle Schools (BMS) (Technical, Commercial, and Artistic Vocational Schools (2016) in the fields of Building Construction, Electrical Engineering, Building Technology, and Mechanical Engineering).
- Curricula of Vocational Higher Schools (BHS) (Higher Technical and Commercial Institutes (2015) for the fields of Building Construction, Electrical Engineering, Building Technology, Interior Design, Wood Technology, and Mechanical Engineering).
- Curricula of Special Forms of Higher Technical and Commercial Institutes (Colleges and Advanced Courses) as well as Preparatory Courses for Working Professionals for

[15] The year of introduction or last update of the relevant training regulations on which the rough analysis is based is given in brackets.

technical disciplines such as Building Construction, Electrical Engineering, Renewable Energy, Building Technology, and Wood Technology.

Incorporation of the following competences, which are currently barely or not represented:

- Digital competences to support improved energy efficiency of buildings, particularly through increased utilisation of Building Information Modeling (BIM) (currently only anchored in colleges and advanced courses).
- Competences for the thermal and energy renovation of historical (listed) buildings.
- Competences related to circular construction and resource efficiency, including the use of sustainable building materials.
- Competences for utilizing the Level(s) framework[16].

A stronger integration of the following competences, which are currently only partially covered:

- Competences for conducting comprehensive building renovations, including through modular and industrialised solutions.

In the field of vocational and BMS education, it is also necessary to strengthen the integration of:

- Competences for enhancing the "intelligence" of buildings to improve overall energy efficiency, grid services, and user comfort (based on the "Smart Readiness Indicator"), particularly in terms of building automation and energy management systems.
- Competences for installers to optimize or renew heating and cooling systems as part of renovation projects (especially in BMS).

Key stakeholders in the implementation of the measure:

- Federal Ministry of Education, Science, and Research (BMBWF)
- Federal Ministry of Labour and Economic Affairs (BMAW)
- Social partners
- Representatives of the wood industry
- ...

Timeframe for implementing the measure:

2024-2030

[16] The Level(s) framework is a new approach by the European Commission to determine and assess the sustainability performance of buildings over their entire life cycle. See https://environment.ec.europa.eu/topics/circular-economy/levels_en, accessed on 17.01.2024

Monitoring indicators:

The training regulations of relevant apprenticeships as well as curricula of relevant educational programmes at Vocational Higher Schools (BMHS) are continuously evaluated for the integration of pending climate-relevant competences necessary for a sustainable building sector.

5.2 Measure 2B: More strongly anchoring climate science competences in the continuing education programmes coordinated by the sponsors (master craftsman, foreman, and building trade schools; NQF 6/without allocation)

Current situation:

The status quo analysis identified gaps in climate science competences in the curricula of master craftsman, foreman and building craftsman schools in the construction industry.

Description of the measure:

In the future, some of the climate science competences must be more firmly anchored in the curricula of master craftsmen, foremen and building trades schools in the fields of construction, timber construction technology, electrical engineering and installation and building technology.

Specific objectives of the measure:

Specialised climate science competences are anchored in the existing curricula of relevant master craftsman, foreman and building trade schools and are thus strengthened.

Options of action:

Anchoring of the following competences currently scarcely or not adequately represented:

- Competences for the thermal and energy renovation of historical (listed) buildings.
- Competences for utilizing the Level(s) framework.

Stronger anchoring of the following competences currently only partially covered:

- Digital competences to support improved energy efficiency of buildings, particularly through increased utilisation of Building Information Modeling (BIM).
- Competences related to circular construction and resource efficiency, including the use of sustainable building materials.

Key stakeholders in the implementation of the measure:

- Federal Ministry of Education, Science and Research (BMBWF)
- Public and private education providers
- Representatives of the wood industry

- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

All curricula of relevant master craftsman, foreman and building trade schools explicitly include the climate science competences required for a sustainable building sector.

5.3 Measure 2C: More strongly anchoring climate science competences in the curricula of bachelor's and master's degree programmes in the building sector (NQF 6 and 7)

Current situation:

As part of the status quo analysis, gaps were identified in the curricula of relevant bachelor's and master's degree programmes regarding climate science competences.

Description of the measure:

In the curricula of bachelor's and master's degree programmes in architecture, civil engineering, construction management, building services engineering, real estate management, and property and facility management[17], as well as others, some climate science competences are currently only insufficiently or not represented; therefore, these need to be (more) firmly anchored.

Specific objectives of the measure:

Specialised climate science competences are anchored in the curricula of relevant bachelor's and master's degree programmes, thus strengthening them.

Options of action:

Anchoring the following competences that are currently scarcely or not adequately represented:

- Competences needed for the thermal and energy renovation of historical (listed) buildings (especially in bachelor's degree programmes)
- Competences needed for utilising the Level(s) framework

[17] Compared to other fields of study, it was noticeable climate science skills in the fields of real estate management and real estate and facility management are clearly underrepresented. Against this background, an initiative was specifically developed as part of measure 1A in the field of action "Addressing new target groups with educational programmes" to counteract this striking difference and promote awareness of climate neutrality in continuing education and training in these specialised areas.

The following competences are currently only partially anchored in curricula:

- Competences needed to create and maintain new and existing Nearly Zero-Energy Buildings (nZEBs) and to bridge the gap to build such Zero-Emissions Buildings (ZEBs)
- Competences needed for integrating renewable energies and efficient heating and cooling technologies, particularly in the deployment of heat pumps.
- Digital competences that support improved energy efficiency of buildings, particularly through the increased utilisation of Building Information Modeling (BIM) (especially in master's degree programmes).
- Competences for enhancing the "intelligence" of buildings to improve overall energy efficiency, grid services, and user comfort (based on the "Smart Readiness Indicator"), particularly in terms of building automation and energy management systems.
- Competences for conducting comprehensive building renovations, including through modular and industrialised solutions.
- Competences related to circular construction and resource efficiency, including the use of sustainable building materials.

Key stakeholders for implementing the measure:

- Federal Ministry of Education, Science and Research (BMBWF)
- Public and private tertiary education providers
- Representatives of the wood industry
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

All curricula of relevant bachelor's and master's degree programmes explicitly include the climate science competences required for a sustainable building sector.

5.4 Measure 2D: More strongly anchoring climate science competences in the curricula of scientific continuing education programmes in the building sector (NQF 6, 7, 8)

Current situation:

As part of the status quo analysis, gaps were identified with regard to climate science competences in the curricula of relevant scientific continuing education courses (examples include the master's course "Sustainable Construction", the university course "Academic Expert in Refurbishment", the university course "Ecological and Economic Life Cycle

Assessment" and the continuing education seminar "Decarbonisation and Sustainability Management").

Description of the measure:

Some of the climate science competences directly related to construction are insufficiently reflected in the curricula and descriptions of scientific continuing education programmes; therefore, these should be (more strongly) anchored.

Specific objectives of the measure:

Expertise in climate science is anchored in the curricula of relevant scientific continuing education programmes, thus strengthening it.

Options of action:

The following competences are currently inadequately anchored:

- Competences needed for the thermal and energy renovation of historical (listed) buildings.
- Competences needed for utilizing the Level(s) framework.
- Competences related to circular construction and resource efficiency, including the use of sustainable building materials.

Key stakeholders for implementing the measure:

- Federal Ministry of Education, Science and Research (BMBWF)
- Public and private tertiary education providers
- …

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

All curricula of relevant scientific continuing education programmes explicitly include the climate science competences required for a sustainable building sector.

5.5 Measure 2E: More strongly anchoring climate science competences in the educational programmes of non-formal continuing education providers in the building sector

Current situation:

As part of the status quo analysis, gaps were identified in descriptions of climate science skill offers from those providing informal continuing education and training for the construction sector.

Description of the measure:

Some of the climate science competences are currently insufficiently or not represented in the descriptions of offers on organisational websites and in course databases from those providing (subject-based) continuing education; therefore, the content of these should be anchored or updated.

Specific objectives of the measure:

A wide range of continuing education programmes are available for acquiring or deepening specialised skills required to ensure a sustainable building sector.

Options of action:

Anchoring the following competences that are currently insufficiently or inadequately represented:

- Competences needed to create and maintain new and existing Nearly Zero-Energy Buildings (nZEBs) and to bridge the gap to create Zero-Emissions Buildings (ZEBs).
- Competences needed for the thermal and energy renovation of historical (listed) buildings.
- Competences related to circular construction and resource efficiency, including the use of sustainable building materials.
- Competences needed for utilizing the Level(s) framework.

The following competences that are currently only partially covered should be more firmly anchored:

- Competences for integrating renewable energy technologies and efficient heating and cooling technologies, particularly in the deployment of heat pumps.
- Competences for enhancing the "intelligence" of buildings to improve overall energy efficiency, grid services, and user comfort (based on the "Smart Readiness Indicator"), particularly in terms of building automation and energy management systems.
- Competences for conducting comprehensive building renovations, including through modular and industrialised solutions.
- Competences for installers to optimize or renew heating and cooling systems as part of renovation projects.

Key stakeholders for implementing the measure:

- Austrian Institute for Technology (AIT)
- Facility Management Austria (FMA) and IFMA Austria
- Public and private education providers
- Austrian Sustainable Building Council (ÖGNB)

- Austrian Institute for Building Biology and Ecology (IBO)
- Future Agency for Construction (ZAB)
- Other institutions such as energy consultancies, Wood Research Austria and the Institute for Flat Roof Construction and Building Waterproofing (IFB).
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

All climate science competences required for a sustainable building sector are transparently identified in the programmes offered by informal training and education and training providers.

5.6 Measure 2F: Developing a competence model for the climate-neutral building sector

Current situation:

As part of the status quo analysis, the competences required to improve sustainability in the building sector were defined, resulting in skills gaps in the existing curricula, training regulations, course descriptions and similar items. This analysis also revealed that the curricular content is vague regarding climate science competences. This not only indicates that rough estimates need to be made, but also highlights the fundamental challenge associated with attempting to align all relevant actors in the multidimensional vocational education system and encouraging them jointly pursue the overarching goal to integrate sustainability into the design and implementation of continuing education and training programmes.

Description of the measure:

To strengthen sustainability in the diverse continuing education and training programmes in the construction sector as a whole and to integrate it into all relevant training programmes in a coordinated effort, a structured competence model for the building sector (new term, e.g. "green-buildingComp") is being developed based on the climate science competences that will be developed as a result of the status quo analysis. In the sense of an occupational field-specific greenComp[18] with content specifically chosen for the building sector, this competence model will be designed to support learning outcomes and comply with NQF by coherently mapping the competences required to improve sustainability in the building sector. These will be structured according to the competence areas and differentiated into (eight) levels of competence, identifying the respective levels, using a similar method as the

[18] https://epale.ec.europa.eu/de/blog/greencomp-lebenslanges-lernen-fuer-eine-nachhaltige-zukunft, retrieved on 18.01.2024

one used to structure digital competences in DigComp 2.3AT[19]. This competence model can serve as the basis for developing a national reference framework for climate science skills in the building sector (like the NRR for digital competences DigComp). In turn, this framework identifies descriptors and can be used as a reference instrument to coherently (and further) develop and compare or monitor continuing education and training programmes. For example, synergies could be created with the current initiative on the Higher Vocational Education and Training Act[20] regarding skilled workers with higher qualification levels. However, the large number of auxiliary workers in the construction industry could also be included by considering NQF levels below level 4 in the competence model or the reference framework.

Specific objectives of the measure:

The competence model and the national reference framework for climate science competences in the building sector are standards that orient all relevant stakeholders towards existing or new education programmes for the building sector, helping them to take an accepted and targeted approach. The climate relevance of training courses can be analysed, designed, and evaluated using corresponding descriptors. This promotes the integration of learning content on energy efficiency, renewable energies, and other topics as well as the transparency of educational programmes regarding their contribution to achieving climate targets. In this way, effective continuing education and training programmes and sustainability in construction education are supported. At the same time, sustainability-based and cross-education sector monitoring is made possible for all education and training programmes from NQF level 4 (and possibly also below) up to 7.

Options of action:

A competence model for climate science competences in the building sector will be developed by:

- Sorting the competence categories named in the status quo analysis into areas of competence
- Differentiating these into eight levels of competence according to NQF/EQF
- Formulating occupational field-specific descriptors for the levels of competence
- Coordinating with relevant stakeholders

A national reference framework for climate science competences in the building sector based on the competence model will be created by:

- Defining a referencing methodology (e.g. in line with the National Reference Framework for Digital Competences)

[19] https://www.fit4internet.at/view/verstehen-das-modell, accessed on 18.01.2024
[20] https://www.parlament.gv.at/gegenstand/XXVII/ME/293 or https://www.wko.at/bildung-lehre/hoehere-berufliche-bildung, accessed on 18.01.2024

- Referencing existing and new education and training programmes and their learning outcomes in terms of climate science competences with respect to the competence areas and competences in the reference framework at the corresponding levels of competence
- Systematically presenting the competence categories and levels of competence included in the referenced educational programmes as well as "gaps" that serve as a basis for (further) development and monitoring

Key stakeholders for implementing the measure:

- Austrian Agency for Education and Internationalisation (OEAD)
- Austrian Institute for Vocational Training Research (öibf)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Federal Ministry of Labour and Economic Affairs (BMAW)
- Industry and interest groups
- Public Employment Service (AMS)
- Public and private education providers
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Existence of a competence model for climate science competences in the building sector.
- Existence of a national reference framework for climate science competences in the building sector.
- Allocation of all relevant continuing education and training programmes to the National Reference Framework.

6 Action Area 3: Promoting participation in continuing education offers

The strategic field of action for promoting participation in continuing education in the building sector was developed in response to the low level of company participation in continuing education in this sector, which emerged from the status quo analysis. The data from the Continuing Vocational Training Survey (CVTS6) show that the construction industry has lower company continuing education activity, employee participation rates, and continuing education expenditure values than other sectors (Statistik Austria, 2023).

The results of the company survey agree with those of the Adult Education Survey (AES), an EU-wide survey of adults (25- to 64-year-olds). Respondents from the construction and building sector had low levels of continuing education activity as compared to other sectors, with 21% stating that they had not participated in any continuing education programmes (Statistik Austria, 2018).

The following measures have been developed to counteract this trend and increase participation in continuing education in the building sector. Specifically, continuing education courses are organised on construction sites to teach practical approaches. Furthermore, we propose that continuing education be anchored in collective agreements to minimise competitive disadvantages for companies that encourage their employees to take part.

The quality of training content should be ensured by facilitating active exchange between educational institutions and places where this knowledge is applied practically. A qualification network consisting of various organisations could create a comprehensive knowledge repository for this purpose. It is also important to increase the attractiveness and compatibility of continuing education programmes for employees by removing obstacles such as time constraints and financial burdens.

Through intergenerational cooperation, older employees' knowledge and practical construction experience should be passed on to younger ones, while the latter should also pass their new knowledge and perspectives on to older colleagues, enabling a bidirectional exchange of knowledge. These comprehensive measures serve to sustainably promote participation in continuing education in the building sector and prepare the industry to meet future challenges.

6.1 Measure 3A: Continuing education on the construction site

Current situation:

In current construction projects (especially in building renovation), conventional construction methods[21] are usually used. One of the reasons for this is that both planners and contractors are often insufficiently aware of how new ecological or alternative construction methods and products can be applied, for example, to increase recyclability and decarbonisation. In addition, some display reservations regarding the use of new processes and products. To overcome this, it is crucial to offer specific training on site (i.e. on construction sites) to familiarise planners and contractors with the advantages of using innovative methods when carrying out specific construction tasks and to help them to overcome their reservations. This also promotes topics such as circularity and decarbonisation in the construction sector.

Description of the measure:

The training locations should be chosen in ways that enable targeted and effective (meaningful) training to take place. These training offers for planners and contractors on the construction site will demonstrate how topics such as circular construction (use of recyclable products) can be considered to carry out specific construction tasks in ways that protect the climate and conserve resources.

Specific objectives of the measure:

- The objective is to to make planners and contractors more aware of the possibilities and practical construction requirements when using alternative, ecological construction methods and building products, for example, to increase the circular economy and decarbonise the building stock.
- The objective is to to reduce planners' and contractors' reservations about new construction methods/building products through "hands-on training" in current projects (strengths/opportunities) and increasing their participation.
- The objective is to to offer training that can be carried out during regular working hours and on site.
- The objective is to to improve how tasks are executed on construction sites in the future based on specific indicators defined in advance depending on the training content, such as the choice of building materials (e.g. increasing recyclability or improving the energy performance of the building).

Options of action:

- On-site training will be offered for building contractors and planners based on specific construction projects (with a focus on renovations), highlighting the possibilities and opportunities for increased consideration of topics such as circular construction (use

[21] In conventional construction methods, innovative approaches to increasing recyclability and decarbonisation are not sufficiently implemented.

of recyclable products) with a low ecological footprint (highlighting alternatives to outdated processes).

- Selective and regular input of, e.g. 2 hours and 3 times a year. Ideally, the appointment is linked to a specific point in the construction process, such as the installation of windows.
- Skills training and review without the risk of causing structural damage by using virtual and augmented reality.

Key stakeholders for implementing the measure:

- Architects, engineering consultants, advisors
- Chambers of civil engineers and civil engineering educational institutions
- Construction companies
- Federal Ministry of Labour and Economy (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Interest groups
- NGOs
- Public and private education providers
- Public Employment Service (AMS)
- Representatives of the wood industry
- Research institutions
- Social partners
- Trade businesses
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Implementation of continuing education measures on the construction site.

6.2 Measure 3B: Anchoring continuing education in collective agreements in the construction industry

Current situation:

Unlike in other sectors, employees in the building sector have no obligation to attend regular company training courses (and particularly on current topics such as circular construction and of the building stock).

Description of the decarbonisation measure:

The implementation of and participation in continuing education should be anchored in all collective agreements prevent these companies from experiencing a competitive disadvantage as compared to companies that promote continuing education. A timeframe should be defined by the professional associations. The added value of continuous company training and education programmes should be clearly demonstrated.

Specific objectives of the measure:

A construction industry- and company-specific verification system should be put in place for the continuing education programmes completed.

Options of action:

Consider companies' continuing education measures in competitions and award procedures.

Key stakeholders for implementing the measure:

- Architects, engineering consultants, advisors
- Chambers of civil engineers and civil engineering educational institutions
- Construction companies
- Federal Ministry of Labour and Economy (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Anchoring of continuing education in collective agreements.

6.3 Measure 3C: Quality assurance of continuing education content - active exchange between education, science, and practice

Current situation:

Topics such as decarbonisation and the circular economy are gradually being integrated into the curricula. However, teachers and trainers sometimes do not have sufficient teaching and learning materials available regarding the latest developments in research and/or practical application.

Description of the measure:

Trainers should be given barrier-free access to (supplementary) teaching and learning materials by establishing a contact point for continuing education and training measures, enabling them to learn more about the topics of circular construction and decarbonisation of the building sector. The person's own continuing education (in theoretical and application-based continuing education) in the field of circular and CO_2-neutral construction will take place through a regular exchange of expertise between scientists and practitioners.

Specific objectives of the measure:

- Apprentices, pupils, and college students have a solid foundation of basic knowledge.
- Train-the-trainer courses enable learning methods to be taught in these areas to both teachers and apprentices, pupils, and college students at the various training centres (providing quality assurance for the transfer of skills).

Options of action:

- Provide target group-specific, quality-assured teaching and learning materials and continuing education programmes (example: supplementary teaching and learning materials on the topics of circular construction and decarbonisation of the building stock).
- Offer quarterly one-hour lectures on relevant topics, with lecturers alternating between scientists and practitioners, placing a focus on decarbonisation and the circular economy.

Key stakeholders for implementing the measure:

- Architects, engineering consultants, advisors
- Construction companies
- Chambers of civil engineers and civil engineering educational institutions

- Federal Ministry of Labour and Economy (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Interest groups
- NGOs
- Public and private educational institutions
- Research institutions
- Social partners
- Trade businesses
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Establishment of a contact point for continuing education measures with barrier-free access to teaching and learning materials.
- Development and implementation of a (regular) professional exchange concept.

6.4 Measure 3D: Qualification network: Decarbonised and recyclable building stock

Current situation:

In Austria, the topics of the circular economy and decarbonisation are presented by various continuing education institutions in different formats. People interested in learning more about the specific scope and content of these programmes often face difficulties accessing this information. Those working in the construction industry often do not know enough about the scope of and access to these programmes or about specialised and suitable training course offers.

Description of the measure:

Qualification networks made up of continuing education institutions impart skills on topics such as the circular economy and decarbonisation of the building stock. Possible partners could be the Public Employment Service Austria (AMS), universities, the Institute for Economic Promotion (WIFI), the BFI Vocational Training Institute (BFI), universities of applied sciences and other organisations.

Specific objectives of the measure:

- By bundling and presenting the various training competences of the participating institutions on a standardised supra-regional platform, those looking for continuing education and specific continuing education courses that meet their specific needs will be able to find them more easily. This platform is designed to enable low-threshold access to continuing education in this area.
- Regular exchanges between experts from the participating institutions should ensure that the training content is continuously updated.

Options of action:

- Develop and continuously update a supra-regional, digital platform with continuing education offers on topics such as the circular economy and decarbonisation.
- Link the proposed training programmes to possible funding opportunities.

Key stakeholders for implementing the measure:

- Architects, engineering consultants, advisors
- Chambers of civil engineers and civil engineering educational institutions
- Construction companies
- Federal Ministry of Labour and Economy (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Industry and interest groups
- NGOs
- Public Employment Service (AMS)
- Public and private education providers
- Research institutions
- Skilled trades
- Social partners
- …

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Number of continuing education courses completed via the qualification network (monitoring via feedback of completions from regional offices to a supraregional platform).

6.5 Measure 3E: Tailoring in-service training and continuing education programmes in response to participants‘ individual circumstances

Current situation:

For many employees, participation in education and training programmes is difficult to reconcile with their individual circumstances, for example, due to a lack of time and financial resources. Inclusive access should be made possible, considering the individual circumstances of employees.

Description of the measure:

To increase participation in continuing education and training in the building sector, the programmes must be more attractive and more compatible with participants' everyday lives. To this end, obstacles such as time constraints and financial burdens should be addressed, for example, by increasing online-based continuing education and training programmes, by offering continuing education and training opportunities during working hours, and by providing relevant funding. Incentives such as career opportunities and promotion prospects can also increase the motivation to participate in extra-occupational training programmes.

Specific objectives of the measure:

- Increasing the number of continuing education and training courses completed through barrier-free training programmes (for example, by overcoming language barriers through multilingual websites or the simplified presentation of graphical website interfaces for easier operation).
- Increasing the attractiveness of continuing education and training programmes for employees and job seekers by reducing time and financial barriers.

Options of action:

- Barrier-free access to (existing) e-learning programmes.
- Enabling continuing education and training during regular working hours.
- Further expansion of state subsidies for continuing education.
- Short, precise continuing education programmes on the current state of the art or knowledge for people who completed their vocational training a few years ago (based on outdated curricula); possibly integrated into a system of individual learning

accounts and microcredentials[22] with the involvement of companies and linked to a support system.

Key stakeholders for implementation of the measure:

- Chambers of civil engineers and civil engineering educational institutions
- Construction companies
- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)
- Public Employment Service (AMS)
- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Increase participant satisfaction with continuing education and training programmes.
- Increase participation in in-service continuing education and training programmes.

6.6 Measure 3F: Promotion of internal knowledge transfer

Current situation:

When employees retire, valuable expertise is often lost in companies. Passing on knowledge that has been built up over many years on to younger employees is crucial for maintaining a company's competitiveness. It is equally important that younger employees pass on their newly acquired knowledge and perspectives to older colleagues to facilitate a bidirectional exchange of knowledge. Effective knowledge management plays a key role in this process, as existing knowledge can be documented, organised, and made accessible to everyone, thus minimising the loss of expertise and promoting the company's ability to innovate.

[22] See the example of a national initiative in Croatia /EU project https://year-of-skills.europa.eu/news/individual-learning-accounts-where-are-we-now-2023-11-21_en, accessed on 06.03.2024

Description of the measure:

Intergenerational cooperation in on-site training is intended to ensure the transfer and retention of knowledge acquired by older employees in the company during their many years of practical construction experience. By supporting interactions between the different generations, knowledge can be transferred from older to younger employees. A reverse learning process also occurs in which younger employees can share their newly acquired perspectives and knowledge with older colleagues, who can benefit from them. This interaction enables these employees to perform more in-depth assessments of the opportunities and risks involved in using, e.g. new, alternative construction methods or products.

Specific objectives of the measure:

Employees from different generations receive theoretical training that teaches them about topics such as circular construction and decarbonisation of the building stock and about the possible practical construction implications.

Options of action:

- Introduce company mentoring programmes.
- Implement a company knowledge platform to secure and provide company knowledge, at least on the topics of decarbonisation and circularity in the construction industry.

Key stakeholders for implementing the measure:

- Architects, engineering consultants, advisors
- Construction companies
- Federal Ministry of Education, Science, and Research (BMBWF)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK)
- Skilled trades
- Social partners
- Workers' councils
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Implementation of on-site buddy training programmes (buddy programmes).
- Implementation of corporate knowledge platforms.

7 Action Area 4: Improving the interface between planning and execution

The communication between planners and executors influences the construction quality and, hence, the sustainability of buildings. Currently, a communication gap exists between predominantly academically trained planners and craftsman teams on construction sites. This gap can result in construction damage and deficiencies in quality and needs to be addressed.

To counteract this problem, measures are presented below that could make this interface more seamless in the future. One approach that can be taken is to introduce sustainability interpreters as quality officers; these individuals should act as key players to promote knowledge transfer between planners and executors and especially focus on the topics of sustainability and energy efficiency.

Another approach that can be taken is to introduce regular and publicly available building damage analyses. These enable transparent documentation of occurring deficiencies and damages and can help to prevent mistakes in subsequent projects.

To ensure high-quality construction and both planned and calculated good energy efficiency of buildings, quality control is required from the construction phase and onwards. Skilled professionals are needed who have training in performing quality assurance in construction; specific continuing education and training programmes are needed so that these individuals can carry out this quality assurance, e.g. by conducting Blower Door tests or thermography. These measures mentioned above are described in detail in the following chapters.

7.1 Measure 4A: Funding programme to establish a "sustainability interpreter" at the interface between planning and execution

Current situation:

At the interface between planning and execution, professionals who typically exhibit high qualification levels are often employed in planning, while personnel with varying levels of technical knowledge and different native languages or proficiency levels in various languages are often employed in execution. The link between these areas is often missing. A sustainability interpreter, working as a quality officer in the construction industry (with a focus on sustainability and energy efficiency), would serve as such a link. Thus, the interpreter could contribute to increasing execution quality and to strengthening the interdisciplinary understanding of sustainable measures. Since there is currently little market demand for such a role, new incentives need to be created to establish such a link (e.g. coupling with funding

programmes), and concepts (e.g. specific job profiles for this role) need to be developed to establish a corresponding position in construction.

Description of the measure:

To reduce the existing communication gap between planning and execution in the construction industry, a programme is being introduced to define, establish, and promote "sustainability interpreters" as quality officers.

Specific objectives of the measure:

A "sustainability interpreter" position will be created to enhance execution quality in the construction industry, strengthen interdisciplinary understanding, and simultaneously promote the demand for qualified professionals in the field of sustainability.

Options of action:

- Develop appropriate models for integrating sustainability interpreters into planning and construction processes.
- Clarify the legal framework (powers) for the introduction of sustainability interpreters.
- Carry out pilot projects in the construction industry to demonstrate the effectiveness of sustainability interpreters.
- Review existing data and experiences in this area and develop a profile for sustainability interpreters, explaining the required competences.
- Integrate the actions mentioned above into existing training programmes and/or develop appropriate continuing education programmes/courses; emphasise coordination between federal states.
- Integrate the position of sustainability interpreters into existing funding programmes and certification systems (e.g. KPC, WKO, klima**aktiv**) for the construction industry.
- Create new incentives, such as financial support or tax benefits, to stimulate market demand.

Key stakeholders for implementing the measure:

- Federal Ministry of Education, Science, and Research (BMBWF)
- Federal Ministry of Finance (BMF)
- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK)
- Planners
- Professional associations
- Skilled trades

- Testing institutes
- …

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Definition of the framework (powers) for the creation of a sustainability interpreter position.
- Clarification of the required competences for preparing inspection reports.
- Definition and development of relevant educational content (derived from the required competences) that can be integrated into existing continuing education and training measures.
- Consideration of the skills of a sustainability interpreter in building certification systems.
- Implementation of pilot projects.

7.2 Measure 4B: Promoting a positive error culture in the construction industry

Current situation:

Currently, both the construction companies and external or internally commissioned experts record construction defects and damages and perform monitoring in the construction industry. In Austria, currently 1,761 generally sworn and judicially certified experts are listed in the field of construction and building trades on the Ministry of Justice website [23]. The individual documentation of defects in a construction project is sensitive and confidential topic, and publication of these documents is usually not in the clients' interests. This may be one reason for the lack of publicly available literature on construction damages in the Austrian construction industry. By increasing the transparency of defects and damages, errors in subsequent projects can be prevented. The detailed identification of the causes of construction damages would enable their attribution to one or more trades, thus providing the basis for the development of targeted and possibly interdisciplinary training and measures.

Description of the measure:

Competences will be integrated into training programmes for managerial and skilled personnel to encourage taking an open and constructive approach towards errors and to promote a positive error culture in the construction industry. The introduction of a regular, publicly available building damage analysis to document deficiencies and damages can

[23] justizonline.gv.at as of 20.3.2023, accessed on 11.12.2023

serve as a basis for addressing potential sources of errors and developing strategies to prevent these errors.

Specific objectives of the measure:

The measure is designed to establish a database that will enable the systematic examination of sources of error and the development of strategies to prevent these errors, while promoting a positive error culture in the building sector.

Options of action:

- The best-practice approach is generally not suitable for this issue. A worst-practice approach related to the identification of construction defects should be considered to highlight and publish defects in an attempt to prevent them in the future. Developing incentive systems for providing data on construction defects (e.g., concerning insurance) could be a future measure. Experts, civil engineers, and/or university staff could prepare data and develop a structure. Expert interviews could reveal how these could be published feasibly. One possible form of data storage could be a publicly accessible, online database that is regularly maintained, supplemented, but also cleaned up.
- Ensure sufficient data availability for the recording of defects and damages that can be used as a basis for training.
- Provide in-depth training for professionals, enabling them to recognise, locate, and interpret construction defects and damages using modern technical methods (e.g. thermographic cameras, drones, sensors).
- Develop suitable training programmes and catalogues of measures by identifying the causes of construction defects.
- Offer trainings for leaders in the planning and construction industry, which will promote a positive error and learning culture that can support the systematic analysis of error sources and prevent errors in the future.

Key stakeholders for implementing the measure:

- Insurance companies
- Planners
- Property developers
- Public and private educational providers
- Representatives of the wood industry
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Increasing the documentation of construction damages and integrating this into curricula at vocational schools, technical colleges, and universities, as well as into continuing education programmes.
- Creating incentive systems for the provision of construction defect data (e.g. in relation to insurance).

7.3 Measure 4C: Quality assurance in construction work with a focus on energy efficiency and sustainability

Current situation:

From the construction phase and onwards, certain instruments for assessing building envelope energy efficiency, such as Blower Door tests or thermographic inspections, are not routinely used, based on experts' experience. Consequently, thermal quality cannot be adequately determined, and leakages as well as potential cold bridges remain undetected. This means that the firms planning and executing the work, as well as the clients, do not receive direct and timely feedback about the energy efficiency of their construction projects

Description of the measure:

Competences in quality assurance in the construction industry, the ability to professionally assess Blower Door tests and thermographic reports, and knowledge of building sustainability certifications (e.g. klima**aktiv**) need to be strengthened. Specific continuing education and training programmes for planning professionals, such as civil engineers, master builders, and graduates of technical colleges (HTL), are required to teach them how to consider and apply quality standards in new constructions and renovations.

Specific objectives of the measure:

The implementation of measures such as sustainability certifications, Blower Door tests, and thermography ensures high-quality construction and energy efficiency. Instruments for assessing the energy efficiency of the building envelope, such as Blower Door tests or thermographic inspections, are used in the planning, construction, and operational phases of a building. The thermal quality is verified once the building is conditioned (heated, cooled, ventilated) by detecting, locating, documenting, and addressing leakages and potential cold bridges. The executing firms, planners, and clients receive direct and timely feedback on the quality of their work, supporting a continuous process of optimisation.

Options of action:

- The quality of the building envelope and the specific installation of technical systems are verified during the official final inspection (occupancy permit), and a test protocol

is created listing possible improvements or necessary corrections. In regions where a notification of completion is sufficient, corresponding random samples can be taken.

- Recognise quality and perform quality assurance during the construction project (i.e. execution phase), treating the need to ensure energy efficiency and sustainability as a responsibility. If necessary, this can be achieved by incorporating these responsibilities into existing processing guidelines.

Key stakeholders for implementing the measure:

- Clients
- Chambers of civil engineers and civil engineering educational institutions
- Planners
- Skilled trades
- Testing institutes
- …

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Conducting continuing education and training programmes for civil engineers, master builders, timber construction masters, and graduates of technical colleges (HTL) focusing on Blower Door, thermography, and building certification systems.
- Adapting formal framework conditions and assigning responsibilities aimed at increasing sustainability related quality assurance in the construction industry.
- Introducing a review of building quality, focussing on energy efficiency as part of the official final inspection (occupancy permit). Taking corresponding random samples in regions where a notification of completion is sufficient.

8 Action Area 5: Enhancing vocational education and training and trades

The fifth strategic action field examines the current situation of apprenticeships and skilled trades in the building sector in Austria. In this context, a focus is directed towards addressing the shortage of skilled workers and overcoming the challenge of the lack of attractiveness of these professions.

To counteract this trend and sustainably strengthen the building sector, corresponding measures have been developed. These can be implemented to improve the image of apprenticeships, demonstrate the diverse benefits of entering these professions to young people and their parents, strengthen the role of company trainers, and promote the broader participation of women and migrants by creating more attractive training structures. Additionally, measures to improve working conditions on construction sites and to enhance the quality of apprenticeships are proposed. By creating new career paths, apprenticeships in the building sector can become more attractive to both young, talented individuals and experienced employees. These measures lend apprenticeships and skilled trades an importance that corresponds to their significance for society and the construction industry.

8.1 Measure 5A: Improving the image of apprenticeships in the building sector

Current situation:

Currently, choosing an apprenticeship in the building sector is not seen as particularly attractive[24]. The advantages associated with an apprenticeship are not adequately perceived by young people and their parents.

Description of the measure:

To improve the image of apprenticeships in the building sector, it is important to demonstrate to both young people and their parents the diverse benefits, opportunities, and prospects offered by entering these professions. The positive opportunities for further development and prospects, for example, are particularly noteworthy in this context and are illustrated by linking these with current initiatives for higher vocational education[25].

[24] WKO apprenticeship statistics
[25] https://www.parlament.gv.at/gegenstand/XXVII/ME/293 or https://www.wko.at/bildung-lehre/hoehere-berufliche-bildung, accessed on 06.03.2024

Specific objectives of the measure:

Young people and their parents will become more aware of the advantages of apprenticeships in the building sector. These include not only the diverse development opportunities but also the strong sense of purpose achieved by carrying out these apprenticeships, due to their great societal relevance (and especially in the context of meeting climate targets). In addition to ensuring crisis and job security, apprenticeships in the building sector also provide a long-term, stable source of income.

Options of action:

- Actively present apprenticeships in all current forms of education from primary school and onwards (e.g. excursions to companies offering apprenticeships), openly highlighting the diverse benefits.
- Promote apprenticeships in the building sector more strongly at career fairs (e.g. by showcasing the top ten most in-demand skilled trades in the economy and by spotlighting exemplary companies and their employees).
- Widely disseminate the best-practice experiences of apprentices and skilled tradespeople to make the profession more attractive.
- Use youth communication media channels (e.g. TikTok, Instagram) for corresponding communication campaigns.
- Expand the "trial apprenticeship"[26] instrument to give young people practical insights into working in a skilled trade, thereby arousing their interest in the corresponding apprenticeship.
- Make apprenticeships more attractive by creating and using modern and appealing teaching/learning and examination formats.
- Carry out information and consultation campaigns and provide support for (potential) training companies that (would like to) hire and train apprentices.

Key stakeholders for implementing the measure:

- Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation, and Technology (BMK)
- Federal Ministry of Education, Science, and Research (BMBWF)
- Federal Ministry of Finance (BMF)
- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal States
- Public and private educational providers

[26] https://www.wko.at/tirol/bildung-lehre/die-schnupperlehre, accessed on 06.03.2024

- Public Employment Service (AMS)
- Representatives of the wood industry
- Skilled trades
- Social partners

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Increase in the number of apprentices and apprenticeships completed in the future.

8.2 Measure 5B: Strengthening company trainers

Curren situation:

Motivated and dedicated company trainers with the competences relevant to creating a sustainable building sector are a cornerstone of the dual education system and essential to meeting climate targets. However, according to stakeholder discussions conducted as part of the project, company trainers are currently insufficiently appreciated, and the career path leading to a position as a company trainer is not viewed overly positively. Consequently, the number of company trainers is decreasing steadily, whereas even more trainers are needed – and especially trainers with climate science competences – to meet the continuously increasing demand for skilled tradespeople. Therefore, it is important to develop measures that underline the importance of company trainers and encourage professionals to choose this career path.

Description of the measure:

Company trainers will be strengthened by expanding the offers of company-funded or publicly financed continuing education programmes. A particular focus is placed on expanding the reach of these offers through interdisciplinary networking, thus creating attractive opportunities for lifelong learning.

Specific objectives of the measure:

The career path to becoming a company trainer is perceived as an attractive career trajectory by professionals. Company trainers are valued by colleagues and seen as role models.

Options of action:

- Expand continuing education offers for company trainers, placing a focus on raising awareness and interdisciplinary networking. This creates an attractive opportunity for lifelong learning for skilled tradespeople.

- Establish the training to become a company trainer as an attractive career path for skilled tradespeople.

Key stakeholders for implementing the measure:

- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal Ministry of Education, Science, and Research (BMBWF)
- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Increasing the number of continuing education offers for company trainers.
- Increasing the number of company trainers.

8.3 Measure 5C: Improving working conditions on the construction site

Current situation:

Currently, the working conditions on construction sites are mentally and physically demanding. For this reason, many skilled workers retire early or are no longer able or willing to work in the construction industry. As a result, the available labour pool is unnecessarily reduced, and potential workers are discouraged from choosing a career in the construction sector. (This is also a significant reason for the current poor image of apprenticeships in the building sector)[27].

Description of the measure:

The working conditions on construction sites should be improved by altering the framework, including the increased use of technological aids, a higher proportion of prefabricated products, flexible working hours, and the corresponding adaptation of legal requirements.

Specific objectives of the measure:

The working conditions on the construction site are improved using technical and legal means, thus supporting the choice of a corresponding career path.

[27] See Measure 5A

Options of action:

- Conduct a comprehensive analysis of possibilities to improve working conditions on construction sites using technical aids.
- Reduce physical strain using technical aids (e.g. drones, exoskeletons).
- Establish legal frameworks to improve working conditions on construction sites.
- Encourage the growth of a positive work culture by providing appropriate training for site managers and team leaders.
- Introduce new, attractive work time models (e.g. 4-day week) and working conditions (e.g. choice of "partner" in the team) for employers.

Key stakeholders for implementing the measure:

- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal Ministry of Education, Science, and Research (BMBWF)
- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

Implementation of an attractive incentive system to motivate skilled workers to voluntarily remain in active employment for longer periods. This not only leads to an increase in the available labour force potential but also contributes to improving the image of the respective profession.

8.4 Measure 5D: Ensuring the quality of apprenticeship programmes through systematic quality management

Current situation:

Between 2007 and 2022, the number of apprentices in the construction sector increased by 2.2%, although a significant decline occurred between 2010 and 2016.[28] Similar trends have been observed in other sectors of importance to the construction industry, such as timber construction or construction-related services.[29] In recent years, various initiatives and measures have been launched to enhance and ensure the quality of apprenticeships. These

[28] See Construction Academy Upper Austria: Opportunities and Risks of Personnel Management in the Construction Industry, 2021 (based on WKO statistics)
[29] See Chapter 4.3.1 of the Status Quo Analysis https://doi.org/10.48341/q71c-g758

include providing training guidelines[30] for training companies and ensuring the availability of quality-assured (digital) teaching and learning materials[31]. Another initiative is the "triangular training concept" in the construction industry, where all participating training companies send their apprentices to training centres (led by construction academies in the respective federal states) for inter-company training[32]. By applying this "triangular training concept" with a third teaching location at construction academies (formerly training centres), qualifications can be acquired that may not always be available at the company[33].

Description of the measure:

By establishing a systematic quality management system for apprenticeship training at companies, inter-company training facilities, and vocational schools, different quality levels will be aligned, ensuring a continuous improvement in the quality of apprenticeship training.

Specific objectives of the measure:

The goal is to establish a systematic quality management system for companies, inter-company training facilities, and vocational schools.

Options of action:

Introducing a systematic quality management system for companies, inter-company training facilities, and vocational schools will help to achieve the following sub-goals:

- Ensure regular training for instructors (see measure 5B, Strengthening Trainers).
- Ensure high-quality training in training companies, for example, by supporting the clear documentation of training offered in companies and the use of digitally supported quality assurance tools.
- Set clear requirements for resources necessary to modernise vocational schools.
- Ensure that all topics are covered during training and that apprentices gain practical experience in as many areas as possible. (Due to the highly industrialised nature of construction work, apprentices in training companies are often trained too narrowly, whereas there is a need for professionals with a broader set of skills, and particularly for carrying out comprehensive renovations), e.g. by systematically developing the tripartite training.

Key stakeholders for implementing the measure:

- Federal Ministry of Labour and Economic Affairs (BMAW)
- Federal Ministry of Education, Science, and Research (BMBWF)
- Public and private educational providers

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[30] See Chapter 6.12 of the Status Quo Analysis https://doi.org/10.48341/q71c-g758
[31] See, for example, E-Building Training at https://www.e-baulehre.at, accessed on 18.01.2024
[32] See Chapter 5.2.1 of the Status Quo Analysis https://doi.org/10.48341/q71c-g758
[33] See Chapter 8.2.4 of the Status Quo Analysis https://doi.org/10.48341/q71c-g758

- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Establishment of an appropriate quality management system.
- Achievement of sub-goals according to the newly established quality management system.

8.5 Measure 5E: Developing and establishing new career paths after completing an apprenticeship

Current situation:

Possible career paths in the construction sector after completing an apprenticeship are currently extremely limited. As a result, choosing a corresponding apprenticeship is not overly attractive.

Description of the measure:

The attractiveness of apprenticeships should be increased by developing and establishing new career paths. This will make skilled trades more appealing and help to retain employees in active employment for longer periods.

Specific objectives of the measure:

The development and establishment of new, attractive career paths in skilled trades are intended to appeal to both younger individuals (e.g., through specialisation in the installation of renewable energy systems, handling sustainable building materials, resource-oriented demolition, etc.) and older craftsmen and women (e.g., through advancement to become a company trainer or quality manager on the construction site).

Options of action:

- Develop new career paths (e.g. by creating new training modules) related to specialisations in sustainability topics. For example, these paths could lead to positions as specialists for installing of sustainable heating systems, for handling sustainable building materials, for planning/sizing energy-efficient and sustainable building services, and much more.
- Further develop or establish career paths for older skilled tradespeople (e.g. promotion to become a company trainer or quality manager on the construction site).

Key stakeholders for implementing the measure:

- Federal Ministry of Labour and Economics (BMAW)
- Federal Ministry of Education, Science and Research (BMBWF)
- Skilled trades
- Social partners
- ...

Timeframe for implementing the measure:

2024-2030

Monitoring indicators:

- Increase in the number of apprentices and future qualifications.
- Increase in the number of company trainers.
- Increase in the number of new career paths in the construction sector.
- Evidence that older employees stay longer in active employment.

9 Conclusions

This national continuing education and training roadmap represents an important milestone along the path that leads to meeting Austria's energy and climate targets in the building sector by 2030 (and beyond). Based on the status quo analysis of the building sector and as part of the collaboration between stakeholders from the key areas of education, business, and politics, five strategic fields of action were identified to address existing gaps and barriers in the educational landscape. Measures were subsequently presented to fill these gaps and overcome these barriers.

The fields of action indicate how new target groups (i.e. apprentices and trainees) will specifically be addressed by creating innovative training programmes, integrating climate science competences in existing apprenticeships and continuing education programmes, increasing and improving continuing education offers, and smoothing the interface between planning and execution. In addition, the fields of action have been chosen to increase the attractiveness of apprenticeship programmes and skilled trades.

The roadmap serves as a guideline for developments in the educational landscape in the building sector, which must be continuously adapted to meet future challenges by supporting dedicated dialogue among stakeholders. Consequently, the measures developed within the strategic fields of action are not static; instead, they should be seen as forming a basis for continuous adaptation and further development. To meet the energy and climate targets set with competent stakeholders, we need to ensure their involvement and willingness to cooperate, identify their needs, and instrumentalise innovative developments in the education sector.

This roadmap demonstrates a high potential for success and sustainability, as evinced by the signed declarations of support from over 65 relevant organisations (as of 18 March 2024, see Table 5). These declarations of support are a clear sign of the broad acceptance and commitment of our stakeholders (e.g. ministries, educational institutions, companies, sector representatives, interest groups) who are committed to implementing the roadmap's measures.

This broad support from relevant stakeholders not only strengthens the legitimacy of the roadmap, but also creates a close-knit network of actors who can pool their resources, expertise, and experience and contribute to the implementation of the educational measures.

In addition, this support ensures the increased visibility and acceptance of the roadmap in society. This helps to raise awareness for the importance of education and training in the context of meeting climate targets and has the potential to attract other stakeholders and partners.

Overall, the roadmap represents a starting point and a framework for follow-up projects and future collaborations. The aim is to use this roadmap to sustainably shape the educational

landscape in the Austrian building sector and thus contribute to meeting the national and European climate targets.

Table 5: List of supporters of the roadmap in alphabetical order (as of 18 March 2024)

	Supporters of the national education and training roadmap (in alphabetical order)
1	1a Installateure
2	3s Unternehmensberatung GmbH
3	AEE intec
4	AH3 Architekten Zt GmbH
5	Amascon Immobilien & Consulting GmbH
6	Arbeiterkammer Wien
7	Arbeitsmarktservice Österreich
8	ARGE Qualitätsgruppe Wärmedämmsysteme
9	Austrotherm GmbH
10	BAZ des BFI Wien
11	Berufliches Bildungszentrum Waldviertel
12	Berufsförderungsinstitut Österreich
13	Berufsschule Freistadt
14	BM Leitner
15	Bundesministerium für Arbeit und Wirtschaft, Sektion VI
16	Bundesministerium für Bildung Wissenschaft und Forschung
17	Bundesverband PHOTOVOLTAIC AUSTRIA
18	Burghauptmannschaft Österreich
19	Climate Change Centre Austria – CCCA
20	Climate Lab
21	Digital findet Stadt - FFG Innovationslabor

22	Energieberatung NÖ
23	Energieforum Steiermark
24	Energieinstitut Vorarlberg
25	Facility Management Austria
26	Felis facilitäre Forschungs- und Beratungsgesellschaft mbH.
27	FH JOANNEUM GesmbH.
28	FH OÖ Studienbetriebs GmbH
29	Gemeinnützige Wohnbaugesellschaft Kamptal
30	Gewerkschaft PRO-GE
31	Green Tech Cluster Styria GmbH
32	HolzCluster Steiermark
33	HTL Krems
34	HTL Pinkafeld
35	IG Lebenszyklus Bau
36	Initiative offene Bildung in Technik und Naturwissenschaften - egenius
37	Innovationslabor Grün statt Grau
38	Institut für Bildungsforschung der Wirtschaft
39	Klimabündnis Steiermark
40	Österreichische Fertighausverband
41	Österreichische Gesellschaft für Nachhaltige Immobilienwirtschaft
42	Österreichische Gesellschaft für nachhaltiges Bauen
43	Österreichische Gesellschaft für Thermografie
44	Österreichischer Gewerkschaftsbund
45	Österreichischer Verband der Immobilienwirtschaft
46	Österreichisches Forschungs- und Prüfinstitut

47	Österreichisches Institut für Baubiologie und -ökologie
48	Österreichisches Institut für Baubiologie und -ökologie GmbH
49	Pro Sustainability
50	Salzburger Erwachsenenbildung
51	SERA energy & resources
52	Stadt Wien MA 19
53	Stadt Wien MA 23
54	STRABAG Innovation & Digitalisation (SID)
55	Teilgewerkschaften Bau-Holz
56	Teilgewerkschaften Vida
57	TU-Graz Technische Universität Graz, Institut für Städtebau
58	UBW Unternehmensberatung
59	Universität Innsbruck, Arbeitsbereich Energieeffizientes Bauen
60	Universität Klagenfurt - Institut für Erziehungswissenschaft und Bildungsforschung
61	Verband Wärmepumpe Austria
62	Weinhäupl Architekten ZT GmbH
63	Wiener ArbeitnehmerInnen Förderungsfonds
64	Wirtschaftskammer Österreich, Bundessparte Gewerbe und Handwerk
65	WKO Landesinnungsmeister der Rauchfangkehrer in der Steiermark
66	Wohnbund:consult
67	Ziviltechnikerbüro Architekt Reinberg
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