White Paper
on Energy-efficient buildings as job-creation motor

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Document information

This task (task force 6 of the IWG5-CSA project) will identify jobs at risk in the construction sector and consider reskilling strategies while taking into account new job opportunities arising within the scope of the clean energy transition. The white paper should touch upon the gender dimension, aspects of societal transformation as well as European policy recommendations and instruments focusing on skills and Just Transition. If relevant, the task force may choose to define and set a territorial focus on regions most affected by these changes. The group will be composed of energy efficiency and renewable energy experts, economists and experts in social sciences from across Europe coming from ministries, relevant agencies, academia and industry. The current Implementation Plan of IWG5 that the task forces will have to update can be downloaded here.

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Contents

1. Executive Summary

A Skills-Driven Approach to Decarbonising Construction

Our approach prioritizes a skills-centric strategy to address the critical challenges of transitioning the construction industry towards a sustainable, low-carbon future. By focusing on upskilling, training, and knowledge development, we emphasize **Equality** and **Certainty** as foundational principles. These dual pathways create a robust framework for equipping the workforce with the competencies needed to meet the energy challenges of decarbonisation. This methodology not only supports transformative change but also ensures alignment with the evolving requirements of the Implementation Plan.

To meet the energy challenges of decarbonizing construction, it is essential to focus on a skills-centric strategy that tackles critical challenges and stimulates the demand for energy efficient skills in the entire value chain of the construction sector.

Skill Development as a Catalyst for Energy-Efficient and Sustainable Construction

The transition to a low-carbon construction industry necessitates significant investment in skills and training to implement energy-efficient and sustainable practices effectively. Upskilling in areas such as energy-efficient design, circular construction methods, and sustainable material usage is critical to reducing the environmental impact of buildings across their entire lifecycle.

The construction industry requires a significant upskilling and training effort to meet the demands of decarbonisation. This includes developing skills in areas such as energy-efficient building design, sustainable materials, and circular economy practices. Furthermore, the industry needs to adopt a Whole Life Cycle perspective, considering the environmental impact of buildings over their entire lifetime.

Meeting the Needs of the Implementation Plan

Our approach aligns with the Implementation Plan's focus on reducing the environmental impact of buildings and promoting sustainable construction practices. By emphasising the need for skills development and upskilling, we can ensure that the construction industry has the necessary expertise to meet the challenges of decarbonization.

Challenges and Opportunities

While there are challenges to be addressed, such as the need for reliable and timely data, the potential benefits of upskilling and training in construction are significant. By developing dedicated task and impact focused training, micro modules, bite size training and harnessing the full advantages of digital transformation we can unlock new opportunities for energy efficiency and sustainability in the built environment.

While digitalization remains an essential enabler of improved operational processes, its potential can only be fully realised when paired with a skilled workforce capable of leveraging advanced digital tools. These include technologies like digital skills passports, which removes

traditional barriers to vocational mobility and other innovations that enhance energy efficiency, address material innovation, and support circularity in construction.

By integrating skills development with digital innovation, the construction sector can rise to the challenge of reducing its carbon footprint, addressing energy inefficiency, reducing the environmental impact of buildings and promoting sustainable construction practices, contributing to the broader sustainability goals outlined in the Implementation Plan.

Concerning the targets of IWG5's implementation plan, the "skills factor" addresses both subgroups of IWG5 (5.1 and 5.2) and is particularly relevant in the following targets:

Innovation Targets

The lack of skills in the construction sector is a pressing issue that hinders the industry's ability to reduce its carbon footprint and achieve energy efficiency. The targets outlined in the Implementation Plan, specifically Targets 5.1-T1, 5.1-T3, and 5.1-T4, highlight the need for innovative solutions to address these challenges.

Target 5.1-T1: Reduce energy use of buildings by 16%

To achieve this target, the construction sector must adopt energy-efficient building methods and materials. However, the lack of skilled workers in areas such as building envelope design, insulation, and renewable energy systems hinders the industry's ability to meet this target.

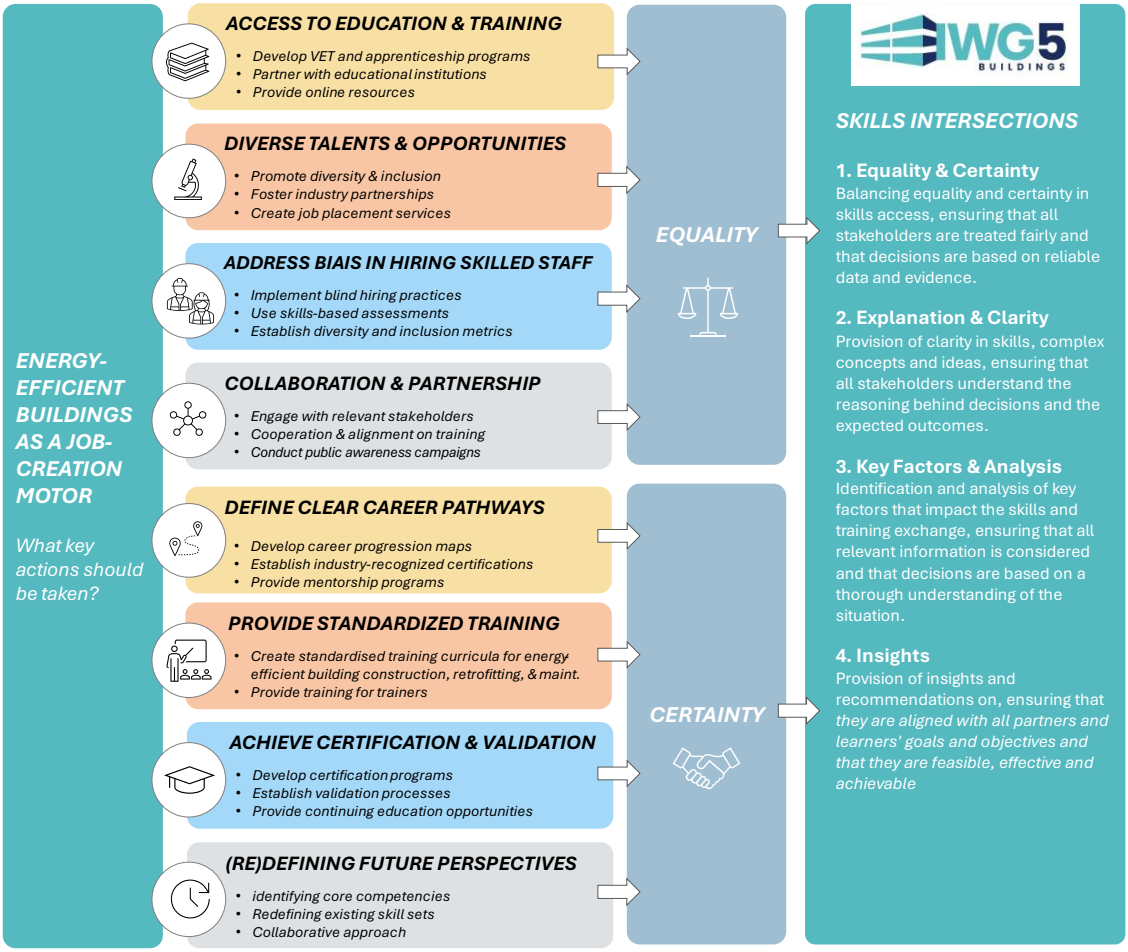
Target 5.1-T3: Reduce average duration of energy-related construction works by more than 40%

The construction sector can achieve this target by adopting modular construction methods, prefabrication, and digitalization. However, the lack of skilled workers in areas such as modular construction, prefabrication, and building information modelling (BIM) limits the industry's ability to adopt these innovative methods.

Target 5.1-T4: Reduce difference between predicted and measured energy performance to maximum 15%

To achieve this target, the construction sector must improve its ability to predict energy performance and reduce the gap between predicted and actual energy use. This requires skilled workers in areas such as energy modelling, building commissioning, and performance testing. However, the lack of skilled workers in these areas limits the industry's ability to achieve this target.

Diagram: “*Skills Framework for Empowering the Workforce to Tackle Decarbonisation Challenges in Construction”*



2. Introduction

The identification of challenges in today's world of skills shortages

The identification of challenges in today's world of skills shortages is a critical issue that affects various industries and economies globally and is especially acute in the construction sector. These shortages magnify the challenge in reducing the carbon footprint in construction. Without the required skills in the workforce, the built environment cannot deploy the latest energy efficient construction methods and remove the endemic carbon in the process.

Challenges in Identifying Skills Shortages

Identifying the skills shortages is the first step in the process. It is a basic prerequisite to measure the gap in the market. These challenges are caused by many factors including the job market, which is constantly evolving, with new technologies and innovations emerging at an unprecedented pace. This makes it challenging to identify the skills required for current construction jobs and importantly the future jobs, as they may not exist yet or are still in the process of being developed.

The current skills market has a distinct lack of standardisation in recognised qualifications which prohibit the transfer and recognition of latent skills. There is no standardized framework for identifying and categorizing skills, making it difficult to compare and analyse skills across different sectors and importantly geographical regions. This issue is further compounded with the limited availability of reliable and up-to-date data on skills shortages, making it challenging to identify the most critical skills gaps. Especially in specific areas where skills are often complex and multifaceted, making it difficult to define and measure them accurately.

The construction sector has always been a sector affected by globalization and mobility with migrant workers filling many gaps especially in on-site jobs. The increasing mobility of workers and the globalization of the job market make it challenging to identify skills shortages in specific regions or industries.

Consequences of Skills Shortages

These skills shortages can be seen across the entire construction supply chain leading to:

- Reduced productivity, companies may not have the necessary skills to complete tasks efficiently.
- Increased costs with companies investing in costly training and development programs to address skills shortages.
- Delayed projects, skills shortages can lead to delayed projects, as companies may not have the necessary skills to complete tasks on time.
- Reduced Competitiveness, skills shortages reduce a company's competitiveness, as they may not be able to innovate and adapt to changing market conditions.
- Increased construction faults, and increased use of materials as a result of the lack of skills.
- Increased carbon footprints. Without the skills to build the energy efficient designs the design/built gap is widening; the carbon footprint of construction is increasing and the building stock is not addressing the climate challenge.

Equality and Certainty – parallel pathways

Equality and Certainty are the two main routes to addressing the skills shortages in today's economy. Achieving balance in the delivery of Equality and Certainty will play a crucial role in addressing skills shortages in the economy.

Equality:

1. Access to education and training: Ensuring equal access to education and training programs can help bridge the skills gap. This includes providing opportunities for underrepresented groups, such as women, minorities, and people with disabilities, to acquire in-demand skills.
2. Diverse talent pipeline: Fostering a culture of equality can attract a diverse pool of talent, bringing different perspectives and ideas to the table. This can lead to innovative solutions and a more adaptable workforce.
3. Addressing bias in hiring: Implementing unbiased hiring practices can help ensure that candidates are selected based on their skills and qualifications, rather than their background or demographics.

Certainty:

1. Clear career pathways: Providing clear career pathways and defined skills requirements can give individuals a sense of certainty about their career prospects. This can encourage people to invest in their education and training.
2. Standardized training programs: Establishing standardized training programs can ensure that workers have the necessary skills to perform their jobs effectively. This can also provide employers with confidence in the abilities of their employees.
3. Certification and validation: Offering certification and validation programs can give workers a sense of certainty about their skills and abilities, making them more attractive to employers.

By focusing on Equality and Certainty, we can create a more inclusive and effective skills development ecosystem. This, in turn, can help address the skills shortages in today's economy.

3. SECTION A - EQUALITY

a) Section A1 – EQUALITY – *ACCESS*

The construction sector has long been characterised by its predominantly blue-collar workforce, often lacking the necessary skills to adapt to the industry's evolving demands, particularly in the realm of energy efficiency (Alhamami et al., 2020). As the global push for sustainable construction gains momentum, there is a pressing need to equip these workers with the knowledge and tools to implement energy-efficient practices. This section examines the potential for digital training solutions to bridge the skills gap and empower blue-collar construction workers to spearhead the transition towards more energy-efficient building practices. An improved skilling of construction workforce would eventually help lowering or addressing a common social bias (i.e. the associated connotation of construction workers with lower social classes).

A key driver of change is digitalisation within the built environment. This affects the need for new skills in two ways: 1) embedding and developing the increasing building digital infrastructure within buildings in line with the IoT nexus enabling continuous monitoring and control; and 2) new construction methods and processes, increasingly resorting to digital, robotics and automated solutions. All of these trends imply that new skills will be needed not only to identify but also to implement suitable building design, construction and renovation solutions across different regions and climates.

However, the construction industry's inherent fragmentation and risk-averse culture has often hindered the adoption of innovative approaches, including the integration of digital tools for training and education. However, the emergence of immersive technologies, such as virtual reality and augmented reality, presents a promising avenue for effective and engaging skill development. These digital training solutions can simulate real-world construction scenarios, allowing workers to practice and master critical skills in a safe and controlled environment, without the risks associated with on-site training.

There is also a need to discover the potential of Building Information Modelling to promote energy efficiency in the built environment. The integration of BIM with training and education can equip construction workers with the necessary digital skills to effectively implement energy-efficient building practices. By combining the power of immersive technologies and BIM-based training, the construction industry can empower its blue-collar workforce to become active participants in the transition towards sustainable construction.

We suggest that the training programs for blue-collar construction workers should focus on developing the specific skills needed for energy-efficient building practices. This includes a combination of hands-on, practical training and digital training solutions that directly address the challenges they face on the job. The hands-on training should cover implementing energy-efficient building techniques, utilizing energy-efficient materials and technologies, and understanding Building Information Modelling for sustainable construction. Digital training, such as virtual and augmented reality simulations, can complement hands-on learning by providing workers a safe and controlled environment to practice and master these critical skills. The goal is to empower these workers with practical

and digital knowledge to participate actively in the transition towards more energy-efficient building practices.

To design such training programs for blue-collar workers we should consider the following:

1. Needs Assessment and Skill Gap Analysis:

- **Target Audience Segmentation**: Identify specific blue-collar worker groups (e.g., electricians, plumbers, HVAC technicians) across different European regions. Analyse existing skills and identify specific training needs for each group related to energy-efficient product installation. Consider cultural and linguistic diversity within the target audience.
- **Local Regulations and Standards**: Research and incorporate relevant building codes, energy efficiency standards, and regulations specific to each European country or region. This ensures the training aligns with local requirements and best practices.

2. Curriculum Development and Content Delivery:

- **Modular Training Approach**: Design modular training programs that cater to different skill levels and learning preferences. This allows workers to customize their learning paths and focus on specific areas of interest or need.
- **Multilingual Support**: Provide training materials and resources in multiple languages commonly spoken by the target audience. Consider using translation services, subtitles, or voiceovers to ensure accessibility for non-native speakers.
- **Blended Learning Approach**: Combine online learning modules with hands-on practical training sessions. Online modules can offer flexibility and accessibility, while practical sessions provide real-world experience with energy-efficient products and installation techniques.
- **Accessibility Considerations**: Ensure training materials and platforms are accessible to individuals with disabilities. This includes providing alternative formats for visually or hearing-impaired learners, using clear and concise language, and offering assistive technologies as needed.

3. Training Delivery and Accessibility:

- **Decentralized Training Locations**: Offer training programs in multiple locations across Europe to minimize travel costs and time commitment for participants. Utilize existing training centres, vocational schools, or community facilities.
- **Financial Assistance and Incentives**: Explore options for providing financial support to participants, such as scholarships, grants, or subsidies. This can help overcome financial barriers and encourage wider participation.
- **Flexible Training Schedules**: Offer training programs during evenings, weekends, or other non-working hours to accommodate workers' schedules and minimize disruption to their employment.

- **Mentorship and Support Networks**: Establish mentorship programs or peer support networks to provide ongoing guidance and support to trainees. This can help build confidence and facilitate knowledge sharing among participants.

4. Quality Assurance and Certification:

- **Standardized Assessment and Certification**: Develop standardized assessment methods to evaluate trainees' knowledge and skills. Offer recognized certifications upon successful completion of the training program to enhance employability and professional recognition.
- **Continuous Improvement and Feedback Mechanisms**: Establish feedback mechanisms to gather input from trainees and trainers to continuously improve the training program and ensure its relevance and effectiveness.

5. Collaboration and Partnerships:

- **Stakeholder Engagement**: Engage with relevant stakeholders, including industry associations, trade unions, government agencies, and educational institutions, to ensure the training program aligns with industry needs and promotes wider adoption of energy-efficient practices.
- **Public Awareness Campaigns**: Conduct public awareness campaigns to promote the benefits of energy-efficient building practices and encourage participation in training programs.

To incorporate equality of opportunity in training programs:

- **Outreach and Recruitment**: Actively target underrepresented groups in the construction sector (e.g., women, ethnic minorities, individuals with disabilities) through targeted outreach and recruitment campaigns. Partner with community organizations, vocational schools, and social services agencies to reach diverse populations. Clearly communicate the benefits of the training program and career opportunities in energy-efficient building practices.
- **Pre-Training Support**: Offer pre-training support to address potential barriers to participation, such as lack of basic digital literacy, language proficiency, or childcare responsibilities. This could include offering preparatory courses, language support, or childcare assistance during training sessions.
- **Bias Awareness Training**: Provide bias awareness training to trainers and staff involved in the program to ensure fair and equitable treatment of all participants. This can help create a more inclusive learning environment and address unconscious biases that may affect training delivery or assessment.
- **Individualized Learning Plans**: Develop individualized learning plans for participants based on their specific needs, learning styles, and prior experience. This can help ensure that everyone has the opportunity to succeed and achieve their learning goals.

- **Career Counselling and Job Placement Assistance**: Offer career counseling and job placement assistance to help trainees transition into employment opportunities in the energy efficiency sector. Connect trainees with potential employers, provide guidance on resume writing and interview skills, and offer support with job searching.
- **Monitoring and Evaluation**: Establish mechanisms to monitor and evaluate the program's effectiveness in promoting equality of opportunity. Track participant demographics, completion rates, job placement outcomes, and gather feedback from participants to identify areas for improvement and ensure the program is reaching its intended goals.

By incorporating these strategies, we can create training programs that not only equip blue-collar workers with the necessary skills for energy-efficient building practices but also promote equality of opportunity and create a more diverse and inclusive workforce in the construction sector.

To further enhance equality of outcome and ensure wider recognition of skills acquired through our training programs, consider these additions:

- **Europe-Wide Valid Digital Certificates**: Explore establishing partnerships with relevant European certification bodies or institutions to develop and issue digitally verifiable credentials upon successful completion of the training program. These credentials should be recognized across European countries, facilitating worker mobility and promoting mutual recognition of skills. Consider aligning with existing European frameworks for skills recognition, such as Europass or EQF (The Issuer, 2023) discusses European Digital Credentials.
- **Micro-credentialing**: Consider implementing a micro-credentialing system that allows workers to earn credentials for specific skills or modules within the training program. This can provide a more granular and flexible approach to skills recognition, allowing workers to showcase their specific competencies and tailor their training to their individual needs.
- **Blockchain-Based Credentials**: Explore the use of blockchain technology to enhance the security, transparency, and verifiability of digital credentials. Blockchain-based credentials can be tamper-proof and easily verifiable by employers, promoting trust and recognition of skills across different countries and organizations. (Digitally-Signed Credentials, 2020) mentions digitally-signed credentials,
- **Integration with National Qualification Frameworks**: Work with national qualification authorities in each participating European country to map the training program's learning outcomes and credentials to existing national qualification frameworks. This can enhance the recognition and value of the training program within each country's education and training system.
- **Promote Credential Recognition among Employers**: Engage with industry associations, employer organizations, and trade unions to promote the recognition and value of the training program's credentials among employers. This can increase the likelihood of trainees securing employment opportunities and demonstrate the value of investing in skills development for energy-efficient building practices.

By incorporating these strategies, we can create training programs that not only equip blue-collar workers with the necessary skills but also provide them with recognized credentials that enhance their employability, promote equality of outcome, and facilitate their participation in the growing green economy across Europe.

b) Section A2 – EQUALITY – *OPPORTUNITY*

The binomial Energy Efficiency & Job Creation necessarily implies the need for educating / training the workforce of the Buildings & Construction (B&C) sector, by up-skilling/re-skilling the current workforce and educating/training additional workforce. It is a sector-wide process, involving the actors of the entire value chain of the B&C sector, from construction products industry to architecture/engineering firms and buildings contractors.

The above-illustrated issue is the crucial point in making Energy Efficiency a catalyser for Job Creation and requires to be faced at different levels (EU, national and sub-national/local level) and in a diversified manner. This includes both High School and post-High School/ Academic education and regular training (e.g.: Lifelong Learning Programmes), accessible by means of both conventional training courses and innovative supportive instruments - digital tools - such as well-conceived and well-structured dedicated Knowledge-sharing IT Platforms aiming at supporting professionals (both architects/engineers/building contractors and technicians/ specialized workforce in different fields) of the B&C sector in the daily work.

In order for the Energy Efficiency to have positive EU-wide effects in terms of Job Creation, it is extremely important to reach out to 'fragile contexts' (fragile contexts are in both Eastern and Western EU countries): in general terms, fragility is linked to political/economic reasons (fragile economies), possible inadequateness of education systems or post-High School/ post-Academic regular training programmes.

Knowledge-transfer Initiatives/ Innovation-transfer Initiatives/Capacity Building Initiatives at EU level (Centralized Initiatives - managed by the concerned EC Executive Agency/ies and with adequate monitoring) are necessary for reaching out to fragile areas.

Insight 1: Innovative supportive instruments

As mentioned above, along with conventional training courses, innovative supportive instruments are necessary to empower professionals of the B&C sector. Sometimes conventional training courses are not affordable (so that professionals are discouraged) or are not well designed and, accordingly, as a result, are scarcely effective.

The naming 'innovative supportive instruments' refers to 'digital tools', aimed at training on a regular basis on different aspects and supporting professionals in their own daily work. **Specialized comprehensive Knowledge-sharing IT Platforms** are included. (e.g.: for the Building Envelope or the Renewable Heating and Cooling (RHC) Systems).

Insight 2: Knowledge-transfer Initiatives / Innovation-transfer Initiatives / Capacity Building Initiatives at EU level addressing especially fragile areas

In general terms, initiatives can be of different nature. For instance:

- supporting national education systems in the 'modernizing process' – enabling them of reacting to the changes in the market needs (i.e.: need for specialized workforce for Energy Efficiency in Buildings applications);
- transferring 'innovative methodologies' aimed at training professionals of the B&C sector;
- supporting concerned entities (e.g.: public authorities / private sector organizations) in 'designing training programmes'.
- providing support by 'training the trainers':

    - State of the Art: Initiatives started by the EU and EU-funded Projects aimed at up-skilling/re-skilling the workforce in the B&C sector
    - BUILD UP Skills : 103 projects funded within the initiative
    - Just Transition Mechanism - Investment Areas (it includes up-skilling/re-skilling/ training) - Just Transition Fund (JTF) Groundwork (capacity building for regional and local administrations and stakeholder is included).
    - Proposal: EU-managed Capacity Building Initiative consisting in creating a Technical Assistance Facility, aimed at supporting the empowerment of professionals of the B&C sector on Energy Efficiency and addressing especially fragile areas in the EU countries.

The basic idea is for the concerned EC Executive Agency to directly manage the above-mentioned Capacity Building Initiative, by means of Pools of Experts in charge of:

- assessing the up-skilling / re-skilling / training needs in specific contexts (especially fragile areas in EU countries)
- supporting by:

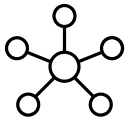
    - designing specialized Education Paths (High School / post-High School / Academic education paths) and Training Programmes addressing different audiences (architects/engineers/building contractors/technicians/on-site workers/craftsmen);
    - developing Train-the-Trainers Programmes
    - implementing the Training Programmes / Train-the-Trainers Programmes, which includes designing / drawing up training materials and 'teaching' (in different modalities: online / in-person/ on-site / blended modalities).

Technical Assistance can be provided in response to requests submitted by, for instance, national / sub-national authorities, public or private educational institutions, private sector organizations. For the Initiative to be effective, producing the expected results, substantial outreach is, of course, essential.

Case Study: post-High School Education (ITS Academy) in Italy

The Italian Education System includes post-High School Education Paths aimed at creating Specialists for the labour world in six technological areas considered strategic for the economic development and the competitiveness of the country. Two of these technological areas are Energy Efficiency and Sustainable Mobility. Training within the ITS Academy is developed by creating synergies with companies, academic institutions, research institutes, public authorities. Currently 104 ITS are active in the country, in six technological areas.

c) Section A.3 – EQUALITY – *OUTCOME*



The future of the construction industry is undergoing a transformative shift, driven by the convergence of technology, sustainability, and human capital. As the industry transitions towards cleaner energy and EU Green Deal pathway, it necessitates the adoption of **innovative technologies** and **industrialisation principles** to achieve high efficiency and quality standards. This paradigm shift demands new hard and soft skills from the workforce. To effectively manage the life cycle impact of construction projects and support the creation of sustainable value chains, **cross-disciplinary knowledge** and professionals are even more required. The prefabrication trend of building products and systems, coupled with the widespread diffusion of new digital technologies throughout a building's lifecycle and the built environment, is paving the way for emerging professions. According to CEDEFOP report on "Construction workers: skills opportunities and challenges" (2023), the up/reskilling plan for construction workers must take into account that:

- 32% of construction workers were aged 50 to 64 years;
- by 2035, an estimated 4.1 million people will be needed to replace those who are expected to leave the occupation;
- In 2021, 77% of construction workers were employed in the construction sector, while manufacturing sector accounting for 11%.
- Only 9% of the construction industry's workforce are women.

Key areas where technological advancements and sustainability initiatives are requiring new skills are:

- **Design of Energy-Efficient and Building Integrated Systems**. This demands expertise in developing innovative, integrated systems like BIPVs (Building Integrated Photovoltaics) and Smart Grids to improve renewable energy production and efficiency in energy management.
- **Develop Innovative Building Products**. This focuses on the development of high-performance materials, components, and technology such as vacuum systems, nanotechnologies, or phase change materials for improving the energy performance of building though "passive" systems.
- **Improve Digitalization and Automation in Manufacturing**. This requires the introduction of industrial approaches and technologies, such as robotic systems and Product Digital Twins, for a rational use of resources and greater market competitiveness for construction companies.

- **Exploit Digital Technologies for Managing the Built Environment**. This implies digital skills for the adoption of technologies such as IoT and Digital Product Passport for the intelligent management of assets in order to optimize economic, environmental and social costs throughout the life cycle.
- **Adopt Data-Driven Tools for Decision-Making**. It demands a data-driven cultural approach and specific expertise in data analytics and AI for exploiting decision-making tool for short-, medium-, and long-term perspective.
- **Spread Sustainable Certification & Good Practices**. It requires a deeper understanding of sustainability certification processes and transparent communication of the benefits generated to increase people's engagement.

Therefore, whether, in the short term, the demand for new professional figures is limited to upskilling traditional processes (e.g., BIM specialists for design or CNC machine operators), in the medium- and long-term scenario, it is conceivable that new professional figures will emerge, driven by a wider adoption of the digital technologies and the evolution of the regulatory framework.

Digital Skills for future construction industry

In relation to the previously identified key areas, new digital skills emerge as crucial aspects for the development and adoption of new approaches and technologies within the construction industry. Based on the taxonomy proposed by *Siddiqui et al.* (2023), the main skills required by construction sector can be organized in:

- **Automation & Robotics**. The ability to design and integrate robotics and automated systems in manufacturing processes and on-site activities to perform construction tasks autonomously, increasing efficiency, precision, and safety.
- **Coding & Programming**. The skill of writing code and programming software solutions tailored for construction projects, such as building management tools and data driven decision making tools.
- **Design, Drafting, and Engineering**. This includes skills in designing new products and innovative building systems that can improve energy efficiency in building.
- **Digital Data Acquisition & Integration**. Aspects related to the integration of digital technologies for monitoring and data analysis of processes
- **AI & Data Analytics**. The capability of analysing large datasets to identify trends, patterns, and insights that can be used to improve construction processes, optimize resource allocation, and predict future needs.
- **Planning & Estimation**. The ability to plan and estimate the resources, time, and costs required for construction projects, ensuring efficient resource allocation and project delivery.

Up/reskilling Demand for Short-Term Scenario

The following list provides an overview of the potential demand for workforce in the short-term scenario for construction industry:

- **Innovative materials technicians**: Knowledge of sustainable and energy-efficient materials, such as bio-based materials, recycled materials, and advanced insulation materials.
- **System integrator designers**: Proficiency in designing integrated energy systems, including solar, wind, geothermal, and other renewable energy sources, as well as energy storage systems.
- **ICT engineers**: Expertise in IoT technologies to monitor and control energy consumption in buildings, enabling real-time optimization and remote management.
- **BIM specialists**: Skill in using BIM software to model and simulate energy performance, identify energy-saving opportunities, and optimize building design for energy efficiency.
- **Digital Twin developers/managers**: Ability to create digital replicas of buildings to simulate energy performance under various conditions, allowing for predictive maintenance and energy optimization.
- **Digital fabricators**: Proficiency in digital fabrication techniques to produce custom, energy-efficient building components and systems.
- Digital operators: Skill in operating CNC machines to manufacture precise, energy-efficient building components.
- **Energy data analysts**: Expertise in analysing energy consumption data to identify patterns, optimize energy use, and identify potential savings.
- **Sustainability experts**: Knowledge of sustainable building practices, including building performance, water conservation, and material selection.
- **Precast fabricators and installers**: Skill in producing and installing precast concrete elements that are energy-efficient and durable.

Up/reskilling Demand for Medium/Long-Term Scenario

In addition to the short scenario, the following list provides an overview of the potential demand for workforce in the medium and long-term scenario for construction industry:

- **3D Printing Specialists**: Experts in the production of customized and complex building components through 3D printing, a technology that is revolutionizing the industry.
- **Drone Pilots and 3D Scanner Operators**: Key figures for the surveying and modelling of construction sites and infrastructures, thanks to the use of drones and laser scanners.
- **Virtual and Augmented Reality Experts**: Professionals who use these technologies for project visualization, personnel training, and construction site management.
- **AI & Data analytics**. Professionals to leverage AI and machine learning to predict maintenance needs, optimize energy usage, and identify potential risks in construction projects.
- **Robotics & automation**. The skill to implement robotic systems for tasks like bricklaying, concrete pouring, and demolition, increasing efficiency and safety.
- **Safety Coordinators with Digital Skills**: Professionals capable of managing construction site safety, integrating digital tools for risk prevention.

Implication on “Equality”

As pointed out, new job opportunities in energy-efficient buildings are primarily linked to the **digital skills** to be integrated into the building process (e.g., automation of the manufacturing/construction) and the management of the built environment and its operations (e.g., smart energy management of building/s). The faster rate of the digital sector evolution requires rapid (and continuous over time) upskilling and reskilling activities. Considering that the **“half-life” of a digital skill** is drastically decreasing (in 2021 it was about 4 years according to the World Economic Forum), this makes worker training an essential and indispensable practice for personal, professional (and corporate) growth. According to current estimates and reports (EC, 2022), only 54% of European people possess at least digital skills and the deficit of software developers and professionals with **advanced digital skills remains a general shortage**. During 2020, 55% of enterprises that recruited or tried to recruit ICT specialists reported difficulties in filling such vacancies. In addition to this, the report reveals a severe gender balance issue, with only 19% of women ICT specialists and 1/3 in STEM graduates. This situation conceals **issues related to equality in access to training advanced skills** as the academic institutions fail to meet the full range of demand. In addition to this, the DESi report (EC, 2022) warns how access to and availability of digital technologies and a broadband Internet connection are essential factors in training future workforce. In fact, overcoming the **Digital Divide** is still far off in the EU context, where fragmented conditions exist between countries, regions and cities. Eurostat data reveal part of the reason: many people simply do not have the **financial** means (among people at risk of poverty, 7.6% do not have internet access), representing a barrier to labour market entry and equal opportunity. In this regard, education must be the great equalizer for employment through equal access to educational resources and the creation of new jobs for energy-efficient buildings. Given these findings, guarantee “equality” principle in educational skills accessibility is crucial to reduce social gaps and foster a more sustainable economy. This requires:

- Boost the education system's ability to deliver advanced, cross-cutting digital skills, expanding training to pre-university levels.
- Empower companies to provide ongoing employee training through increased incentives and co-funded programs.
- Bridge the Digital Divide and ensure equitable access to training and digital tools for lower class people.
- Foster initiatives to increase the number of women in the energy-efficient buildings sector.

4. SECTION B - CERTAINTY

a) Section B1 – CERTAINTY – *DEFINITION*

In order to close the energy gaps in construction we must evolve towards being a skills-based industry.

The Definition of Skills Certainty

Defining skills certainty is an ever-increasing critical aspect of modern workforce development. Skills certainty refers to the confidence that an industry and/or individual has in their ability to perform specific tasks, jobs, or roles, and that their skills are relevant, up-to-date, and in-demand by employers.

In today's world of traditional learning, we utilise standard metrics and frameworks to help define skills certainty including;

- Clearly defined learning objectives that align with industry needs and job requirements can help learners understand what skills they need to acquire and provide a sense of direction.
- Standardized competency frameworks that outline the skills and knowledge required for specific jobs or roles can help learners understand what is expected of them and provide a common language for employers and educators.
- Regular assessment and validation of learners' skills and knowledge to assist them demonstrate their capabilities and provide a sense of accomplishment.
- Industry recognised credentials such as certifications or badges, can provide learners with a tangible representation of their skills and knowledge, and demonstrate their expertise to employers.
- Employer endorsement of training programs and credentials to provide learners with confidence that their skills are relevant and in-demand and increase their chances of employment.
- Developing continuous learning to encouraging a culture of continuous learning to help learners stay up to date with the latest skills and technologies, and provide them with the confidence that they can adapt to changing job market demands.
- The provision of transparency and accountability in training programs, such as clear learning outcomes, assessment criteria, and evaluation methods, to assist learners understand what they are getting and provide a sense of trust in the training provider.
- Providing learner feedback and support to learners assists them to stay on track, address knowledge gaps, and build confidence in their skills.
- Creating skills maps that illustrate the relationships between different skills and competencies can help learners understand how their skills fit into the broader job market and provide a sense of direction for future learning.
- Using data analytics to track learner progress and outcomes can help identify areas for improvement and inform training program development, providing learners with a sense of confidence that their skills are relevant and in-demand.

By incorporating the metrics and frameworks, skills certainty can be defined as the confidence that an individual has in their ability to perform specific tasks, jobs, or roles, and that their skills are relevant, up-to-date, and in-demand by employers.

This confidence is built on a foundation of clear learning objectives, standardised competency frameworks, assessment and validation, industry-recognized credentials, employer endorsement, continuous learning, transparency and accountability, learner feedback and support, skills mapping, and data-driven insights.

Redefining access to training to provide skills certainty

Redefining access to training to provide skills certainty is a crucial aspect of modern workforce development especially in the construction sector where the design, built gap is widening because of a lack of skills in construction. In today's fast-paced and ever-evolving job market, it is essential for individuals to have access to relevant and up-to-date training to remain competitive and adaptable. Redefining access to training must be developed in tandem with traditional learning routes and complement these pathways.

Through the implementation of personalised learning paths that cater to individual needs and career goals we can help ensure that learners acquire the skills they need to succeed. This can be achieved through AI-powered learning platforms that use data analytics to identify knowledge gaps and recommend tailored training programs.

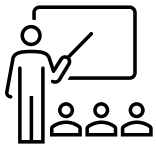
Microlearning approaches such as breaking down training into bite-sized, modular chunks (microlearning) as illustrated in the ARISE project (ARISE – awakening – relevant – innovative – scalable – equitable) can make training and learning more accessible and manageable for learners with busy schedules. This approach also enables learners to focus on specific skills or topics, rather than committing to lengthy courses. This digital first approach from the ARISE project redefines training access by providing on-demand training options, such as online courses, webinars, and video tutorials, can help learners access training at their convenience. This flexibility is particularly important for those with non-traditional work schedules or those who need to balance work and family responsibilities. Through the provision, recognition and validation of learners' skills and achievements helps them demonstrate their capabilities to employers and advance their careers. This is achieved through digital badges, certifications, competency-based assessments and digital skills passports. This digital transformation approach also enables the utilisation of data analytics to track learner progress and outcomes can help identify areas for improvement and inform training program development. This data is also be used to provide learners with personalised feedback and recommendations for further training.

The ARISE project and others such as BIMcert (BIMcert – Construction Skills – Energy Efficiency – Regulating Supply Chains – Tackling Climate Change focus on task and impact (TIBM) skills-based training, rather than traditional degree-based programs, can help learners acquire specific skills that are in high demand by employers. This approach can also help address the growing skills gap in various industries.

The digitalisation of course content and delivery ensure that training programs are accessible and inclusive for all learners, regardless of their background, location, or abilities, is crucial. This can be achieved through the use of accessible technologies, such as screen readers and closed captions, and by providing accommodations for learners with disabilities.

Developing a cycle of participation and learning assists learners stay up to date with the latest skills and technologies. This can be achieved through regular training sessions, workshops, and conferences, as well as by providing resources and support for self-directed learning.

b) Section B2 – CERTAINTY – *PROVISION*



The third edition of the World Energy Employment (WEE) report, recently published in November 2024, examines the global energy employment environment as the energy transition progresses. The report offers a detailed overview of energy employment, including estimates of the workforce's size and distribution across different regions, sectors, and technologies, including energy efficiency in buildings and industry.

The report states that construction and installation was the second clean energy sector responsible for the most job additions in and the overall energy industry in 2023 in the world. However, in the 2019-2022 period, it was responsible for over half of net job growth.

The results of this study report that efficiency investment in the buildings sector fell by 7.1% in 2023 and was projected to fall by a further 3.8% in 2024. In this context, global employment in building efficiency measures remained flat at 5.3 million in 2023, including a strong decline in the European Union. Overall, employment in buildings and industrial efficiency contracted by 0.3% in 2023. The study's conclusion claims that to be consistent with a net zero global economy by 2050 the sector would require much higher investment and employment in the construction sector. This falls into an expected growth of 14.7 million in 2030, representing a 5.9% compound annualised growth rate over that period.

In this line, another obstacle is the difficulty to hire due to skill shortages for nearly all related occupation categories. In addition, problems increase due to the fact that many trade workers are self-employed or in micro-enterprises, meaning training must be self-financed.

Some strategies to address the shortages are:

- Renewed focus on vocational training
- Government incentives for training
- Companies offering on-the-job training to deliver these skills themselves.
- Upskilling workers from related occupations can be a time and cost-effective solution

Consequently, the EU is encouraged to provide means and certainty regarding how the construction sector will evolve in terms of energy and resources efficiency, and other drivers, to ensure a just, orderly and safe transition for workers.

The European Commission Transition pathway for construction has highlighted a skills and talent block addressing skills gaps and anticipating future skills needs in construction will mean providing more, better, and safer jobs. Construction faces challenges with technology transfer, dispersed workplaces, and low innovation rates. It has trouble attracting young and diverse workers including women. Upskilling professionals and modernising/digitalising construction techniques and processes are key to improving working conditions and the reputation of construction as an employer. The skills of the whole workforce are therefore crucial for the resilience and productivity of the ecosystem and the sustainability of buildings and infrastructures.

CONSTRUCTION SECTOR DRIVERS AND LEGISLATIVE FRAMEWORK

The focus of the European Union regarding the construction sector falls in the decarbonization of the sector through the European Green Deal. To achieve this goal, the main drivers for the evolution of the sector and job creation in new profiles are building renovation for energy efficiency, digitalization, industrialization, and circularity. Besides, changes in the sector are also promoted by the market needs and economic reasons, which falls in the construction companies.

These drivers pose a scenario where new skills are required. However, to overcome the challenge that poses creating new jobs in this fields some efforts should be made towards the evolution of the sector; by promoting policies and regulations in construction and buildings, initiatives promoting education, open information and public funding, adhesion of companies to related initiatives, etc.

In this sense, the European Union has been fostering changes in the construction sector by means of various initiatives and legislation, the most important for the topic are presented below:

Building Renovation for Energy Efficiency

The Energy Performance of Buildings Directive (EPBD) promotes energy-efficient building renovations. The directive aims to accelerate the renovation of buildings, particularly those with poor energy performance, to meet decarbonization goals. Additionally, the “Renovation Wave” strategy under the European Green Deal aims to double the annual energy renovation rate of buildings by 2030, boosting the demand for sustainable renovation and retrofitting. The EU plans to move from the current nearly zero-energy buildings to zero-emission buildings by 2030. The Renovation Wave is expected to create new jobs in building renovation and renewable technology installation. Besides, to the new European Bauhaus.

Digitalization of Construction

The European Digital Strategy and the Digitalization of European Industry (DEI) initiative support the digital transformation of the construction sector. Transition Pathway for Construction was published on 15 March 2023, and aims for a more resilient, green and digital construction ecosystem. These initiatives encourage the use of digital technologies such as Building Information Modelling (BIM) to improve efficiency and sustainability. Besides, the SRI

initiative accounting for digitalization of buildings, aiming to measure building's capacity to use smart-ready services, key enablers of the decarbonisation of the building sector.

Industrialization of Construction

The EU Industrial Strategy 2020 includes measures to promote the industrialization of the construction sector, such as prefabrication and modular construction. These methods can reduce costs and construction times while improving quality and sustainability. However, there is no specific documents or policies on automation or industrialization of construction systems apart from Construction Products Regulation CPR, that must by complied by all construction products regardless the production process. These CPR is under update, modifying the existing EU rules in that area, providing an opportunity to adapt standardisation to new technical developments, providing better information to consumers with the creation of product digital passports and facilitating green choices.

Circularity in Construction

The Circular Economy Action Plan and the EU Strategy for Circular Economy are key to promoting circularity in construction. These policies encourage the reuse and recycling of construction materials, reducing environmental impact and enhancing sustainability.

These legislative frameworks and initiatives do not only aim to improve the efficiency and sustainability of the construction sector but also to create jobs and foster innovation. However, they outline the objective solutions needs but do not show the specific path for implementation. Giving the opportunity for 'free' interpretation and leading countries to set their own paths, not always ensuring certainty as to the procedures, skills and certifications required to commit the tasks ultimately in the field of work.

CLUSTER OF SKILLS. HOW TO INDUCE TO CERTAINTY

In the first place there is a need to ensure that relevant policy frameworks and regulatory measures are developed, to promote not only the implementation of the policies (about energy efficiency, digitalization, industrialization, circularity…) but the path that this implementation should follow. This should include the adequation of the work force to the work to be done, by outlining skills needed and how to provide skills (certification), job equality, gender equality, legalization of informal employment, etc. This process should be carried out in collaboration with public and private actors to coordinate all activities under a common and shared strategy, due to the high complexity and interrelation of the sector.

For this reason, the construction sector asks for a strong partnership between the European institutions, Member States and construction social partners and stakeholders to steer the transformation of the sector with the most adequate policies and tools.

In fact, there are various initiatives and clusters working with the same objective (among others):

- 2021 Commission staff working document: Scenarios for a transition pathway for a resilient, greener and more digital construction ecosystem: some proposals for Possible actions and division of roles are highlighted.
- The Commission launched the Blueprint for Sectoral Cooperation on Skills initiative to improve skills intelligence and address short and medium-term skills needs. In this context, the Construction Blueprint project (2019-2023) focused on digital skills, as well as skills in energy efficiency and circular economy. These resulted in such documents: Construction workers: skills opportunities and challenges (2023 update)
- Initiatives for youth employment in the construction industry
- Sectoral strategic approach to cooperate in the construction industry. WP5: Identification of occupation and professional profiles to be updated. 2022 Report on the professions and qualifications to be subject of modernisation. This report identifies the skills and professionals needed for energy efficiency, circular economy and digitalization.
- Training courses co-funded by the European Union such as “training course for improvement of skills, competences and knowledge of worker in construction sector”

These initiatives set a good framework for certainty in the creation of jobs in the construction sector, being able to define and provide tools for change: identifying skills, trends and ways to address the difficult challenge. So far in the process of energy renovation of European buildings, the objectives of providing adequate skills to the workforce, equality of access, opportunity and outcome have not been achieved. This is due to the inertia in the current system, the time needed to implement new initiatives and the lack of regulation. Therefore, to achieve the creation of quality jobs, efforts must be made to create employment policies in the sector, highlighting the European Union's framework for action, to meet the objectives and achieve equality and certainty among the territory.

c) Section B3 – CERTAINTY – *ACHIEVEMENT*

Small and medium-sized enterprises (SMEs) dominate the construction sector, especially in low-income countries. SMEs face several challenges in the transition to sustainable and energy-efficient practices. The reasons are limited technology transfer, low innovation capacity, and a stagnant growth rate. Moreover, SMEs often operate with constrained resources, making investing in new practices, adopting digital tools, or transitioning to energy-efficient solutions difficult. This reliance on outdated methods reduces this sector's overall sustainability and resilience.

One of the primary challenges SMEs faces is the need for access to and implement cutting-edge technologies. Compared to larger corporations, SMEs often need help to bridge the gap between research-driven innovations and their practical application on-site. Without adequate technology transfer mechanisms, they are unable to fully utilize advances in areas such as sustainable building materials, digital modelling, or energy-efficient systems. This creates a significant barrier to modernizing their operations. Building Information Modelling (BIM) and material traceability systems offer substantial opportunities for SMEs to enhance their practices. However, limited access to these technologies and a lack of collaboration between

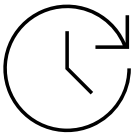
SMEs and research institutions create a substantial barrier to innovation. Weak or almost no cooperation between SMEs and the research institutes is also due to the cost of such research efforts. Regional innovation hubs and partnerships between universities and SMEs can play a vital role in bridging this gap, enabling the practical application of sustainable technologies.

Another critical issue is the limited capacity for innovation within SMEs. Resource constraints, including tight budgets and small workforces, prevent them from dedicating time or funding to research and development. As a result, they are less likely to explore or adopt new technologies, perpetuating a cycle of stagnation that hinders the adoption of sustainable and energy-efficient practices. Financial and policy support is crucial for SMEs to overcome economic constraints. Offered grants, tax incentives, and low-interest loans tailored to the needs of SMEs can alleviate the costs associated with adopting energy-efficient practices. Furthermore, harmonizing regulations across the EU and simplifying compliance procedures can reduce administrative burdens, enabling SMEs to focus on innovation and growth.

The fragmentation of support systems across regions further complicates the situation. SMEs often face inconsistent access to funding, innovation hubs, and collaborative networks, which are crucial for fostering growth and adoption of sustainable practices. Disparities in regional policies and support structures create an uneven playing field, leaving many SMEs needing more tools and opportunities to thrive in a competitive market. The gap in skills in the construction workforce remains another significant challenge. Flexible training programs incorporating modular learning, digital tools, and sustainable construction methods are essential to upskill workers effectively. Models that integrate "work-life-learning" can ensure that SMEs' employees continue earning while gaining new competencies.

By leveraging regional collaboration, financial incentives, digital tools, and targeted upskilling initiatives, SMEs can become key drivers of the clean energy transition. Addressing these barriers comprehensively will not only empower SMEs but also contribute to regional economic growth and sustainability.

d) Section B4 – CERTAINTY – *PERSPECTIVE*



Certainties on upskilling and training of performance guarantee for durability, service life and climate resilience of buildings

The construction sector faces unprecedented challenges as it transitions toward more sustainable, energy-efficient, and climate-resilient buildings. The growing emphasis on addressing climate change, reducing carbon footprints, and increasing the service life of building assets requires a significant shift in how the industry approaches skills development. In this context, the need for upskilling and training of construction professionals is paramount to guarantee long-term building performance, durability, service life, and resilience to extreme weather conditions.

The construction industry should ensure certainty in its upskilling and training initiatives, focusing on defining/redefining skills, providing appropriate training, and delivering effective outcomes. These elements are crucial for creating buildings capable of meeting the challenges of modern construction and achieving sustainability goals.

Defining/Redefining Skills for Sustainable and Resilient Buildings

The concepts of durability and climate resilience for buildings go beyond simple materials and techniques. They encompass an integrated approach that considers the long-term performance of buildings in the face of extreme weather events, changing climate conditions, and evolving energy demands. As such, the definition and redefinition of skills in the context of construction must align with these emerging needs to build sustainable and resilient structures.

Identifying Core Competencies

Skills and competencies related to sustainability, energy efficiency, and resilience include expertise in areas such as:

- **Climate-resilient Design**: Understanding how buildings can adapt to extreme weather conditions, with particular focus on heatwaves, floods, and other climate-related stressors.
- **Material Innovation**: Knowledge of biobased, low-carbon, and circular building materials, as well as the integration of these materials in new constructions and renovations.
- **Moisture Management and Hygrothermal Performance**: Proper moisture management is essential for ensuring the durability and health of buildings. Professionals must be trained to understand and mitigate moisture risks, which can lead to mould, decay, and structural damage.

Redefining Existing Skill Sets

As the construction sector evolves, it is necessary to update traditional skill sets to meet the needs of the climate-resilient built environment. For example:

- **Integration of Digital Tools**: With technologies like Building Information Modeling (BIM) and Building Operation Modeling (BOM) becoming standard in the industry, workers need to understand how to use these tools to track and monitor building performance throughout the service life.
- **Circular Construction Practices**: Redefining construction professionals' roles to include knowledge of Design for Disassembly (DfD) and circular economy principles ensures that buildings are not only durable but can be easily deconstructed for reuse at the end of their life.

Collaborative Approach

The development of these competencies requires ongoing collaboration among industry professionals, research institutions, and educational organizations. These partnerships are critical for redefining what skills are necessary to ensure that the industry is future-proof and resilient to climate change.

Provision of Effective Training for Sustainable Building Practices

Once the necessary skills have been clearly defined, the next step is to ensure the provision of comprehensive and accessible training. To create a construction sector capable of delivering on the promise of durable, energy-efficient, and climate-resilient buildings, the training infrastructure must be robust, inclusive, and forward-looking.

Access to Quality Training

- **Inclusion and Accessibility**: Training programs must be accessible to a diverse range of individuals. This includes offering programs in various formats (e.g., digital, face-to-face, on-site) and providing financial assistance through scholarships or government-funded initiatives.
- **Partnerships with Educational Institutions**: Collaboration with universities, vocational schools, and specialized training centres is essential for creating programs that bridge the gap between theory and practice. This collaboration also allows for the integration of the latest research and innovations in building materials, sustainability, and resilience into curricula.

Industry-Specific Training Modules

To provide effective training, it is essential to develop industry-specific modules that cover the full spectrum of skills needed for building durability and climate resilience. This includes, but is not limited to:

- **Advanced Building Systems and Automation**: Training on the latest advancements in building automation, including energy-efficient heating, ventilation, and air conditioning (HVAC) systems and smart building technologies that improve energy performance and overall sustainability.
- **Circular Design and Materials Handling**: Practical knowledge of designing buildings for disassembly, selecting sustainable materials, and managing the reuse of resources to minimize waste and extend material life.

Accreditation and Standards

To ensure that training programs lead to meaningful outcomes, they must align with recognized industry standards and certifications. These certifications will help validate the skills and knowledge gained by professionals, ensuring that the workforce is competent and able to meet the challenges of modern, sustainable construction.

Delivering and Achieving Effective Training Outcomes for Building Resilience

The final challenge lies in delivering and achieving the training outcomes that are essential for creating sustainable, resilient buildings. It is not enough to simply provide training opportunities; these opportunities must lead to tangible improvements in building performance, durability, and climate resilience.

Blended Learning Approaches

A combination of theory and practice is essential for ensuring that professionals can apply what they have learned to real-world situations. Effective training models should incorporate:

- **Hands-on Workshops**: Simulated construction environments where workers can practice using new tools, techniques, and materials.
- **On-the-Job Learning**: Structured apprenticeships or mentorship programs where trainees can learn directly from experienced professionals in live project environments.

Monitoring and Assessment of Progress

To ensure training effectiveness, continuous monitoring and assessment are necessary. This can be done through:

- **Competency-Based Assessments**: Ongoing evaluation of professionals' practical abilities and knowledge through structured tests, projects, and feedback loops.
- **Performance Tracking**: Using tools like Building Information Modelling (BIM) and Building Operation Modelling (BOM) to track how well buildings constructed with new techniques and materials are performing over time. This ensures that designers, builders, and workers are trained to deliver real-world, sustainable solutions that work as intended.

Post-Training Support and Certification

The delivery of effective training does not end with completion of a course. There must be continuous support to ensure professionals can continue developing their skills throughout their careers. This could include:

- **Mentorship Programs**: Providing post-training support through mentorship and guidance as professionals continue to apply their skills on projects.
- **Lifelong Learning**: Offering continuing education programs that allow professionals to stay updated on new technologies, materials, and methods as they emerge.

Additionally, certification is critical for validating the outcomes of training programs and ensuring that professionals possess the necessary qualifications to implement climate-resilient and durable building solutions. These certifications should be recognized across the industry to ensure career mobility and professional growth.

5. CONCLUSION

In conclusion, achieving sustainable and resilient buildings requires a comprehensive approach that prioritizes a skills-centric strategy to address the critical challenges of transitioning the construction industry towards a sustainable, low-carbon future. By focusing on upskilling, training, and knowledge development, we emphasize Equality and Certainty as foundational principles, creating a robust framework for equipping the workforce with the competencies needed to meet the energy challenges of decarbonization. This methodology not only supports transformative change but also ensures alignment with the evolving requirements of the Implementation Plan, ultimately enabling the construction sector to create buildings capable of withstanding the challenges posed by climate change and evolving sustainability requirements.

Foundational Principles:

1. Equality: Ensuring that all individuals have access to training and development opportunities, regardless of their background or circumstances.

2. Certainty: Providing a clear and consistent approach to training and development, ensuring that the industry is equipped with the skills and knowledge needed to meet the demands of modern construction.

The transition to a sustainable, climate-resilient built environment depends on an industry that is highly skilled and adequately trained to meet the demands of modern construction. By focusing on defining and redefining skills, providing effective training, and delivering measurable outcomes, the construction sector can ensure that its workforce is equipped to meet the complex challenges of the 21st century. Ensuring certainty in these processes guarantees that the training provided is not only aligned with industry needs but also accessible to all, fostering equality and opportunity across the sector.

As the industry embraces the challenges of climate change, resource scarcity, and technological advancements, the development of sustainable, resilient buildings is crucial for ensuring long-term durability and performance. Through these initiatives, the construction sector can not only meet current demands but also future-proof itself against evolving challenges, creating a built environment that stands the test of time and has value for the industry in terms of productivity and competitiveness. By prioritizing a skills-centric approach, the construction sector can unlock a sustainable and resilient future, one that is characterized by high-performance buildings, reduced environmental impact, and a highly skilled and adaptable workforce. Ultimately, this approach will enable the construction sector to play a critical role in shaping a more sustainable and resilient future for generations to come.

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