InCUBE

sustainable building innovations

Training material on
Social Inclusion & Gender Impact Matrix

17th March 2026
InCUBE Training

Learning objectives

Purpose of the training

This training introduces the concepts of **social inclusion in deep renovation** and the **Gender Impact Matrix (GIM)** developed in the InCUBE project. Participants will explore how renovation processes can address social justice concerns and how gender dynamics shape employment and technological adoption in the construction sector.

After reviewing this material, readers should be able to:

- Understand the concept of social inclusion in renovation projects
- Identify practical measures that improve inclusion during renovation
- Understand the purpose and structure of the Gender Impact Matrix
- Reflect on gender inequalities in the construction and energy sectors.

Social Inclusion in Deep Renovation

What is Social Inclusion?

Social inclusion is the process of enhancing the terms on which individuals and groups participate in society, **improving the ability, opportunity, and dignity** of those disadvantaged based on their identity.

InCUBE Scope

The **scope of social inclusion lies in improving the renovation process for actors involved** in the three demo sites, ensuring that the renovation activities are technically viable, sustainable and socially equitable.

Source: (Ricci et al., 2025)

Social Inclusion in Deep Renovation – Distributive justice

Goal

Ensure the **benefits and burdens** of deep energy renovation are distributed fairly, without disproportionately affecting vulnerable households.

Key elements	Examples in deep energy renovation
Fair distribution of costs and benefits	• Targeted subsidies for low-income households • Fair allocation of retrofit investments
Social protection for residents	• Legal safeguards against renoviction • Rent-neutrality (energy savings exceed rent increases)
Equitable outcomes	• Reduction of energy poverty • Verifiable improvements in health and thermal comfort

Social Inclusion in Deep Renovation – Procedural Justice

Goal

Ensuring that those affected by renovation are meaningfully involved in decisions and that governance processes are transparent and accountable.

Key elements	Examples in deep energy renovation
Inclusive participation	• Involve residents early in renovation planning • Co-design renovation measures with tenants and communities • Train residents on use of new systems
Transparent decision-making	• Provide clear information on costs, benefits, and disruptions • Communicate renovation timelines and expected impacts
Collaborative governance	• Facilitate dialogue between residents, housing providers, and policymakers • Maintain engagement throughout planning and renovation stages

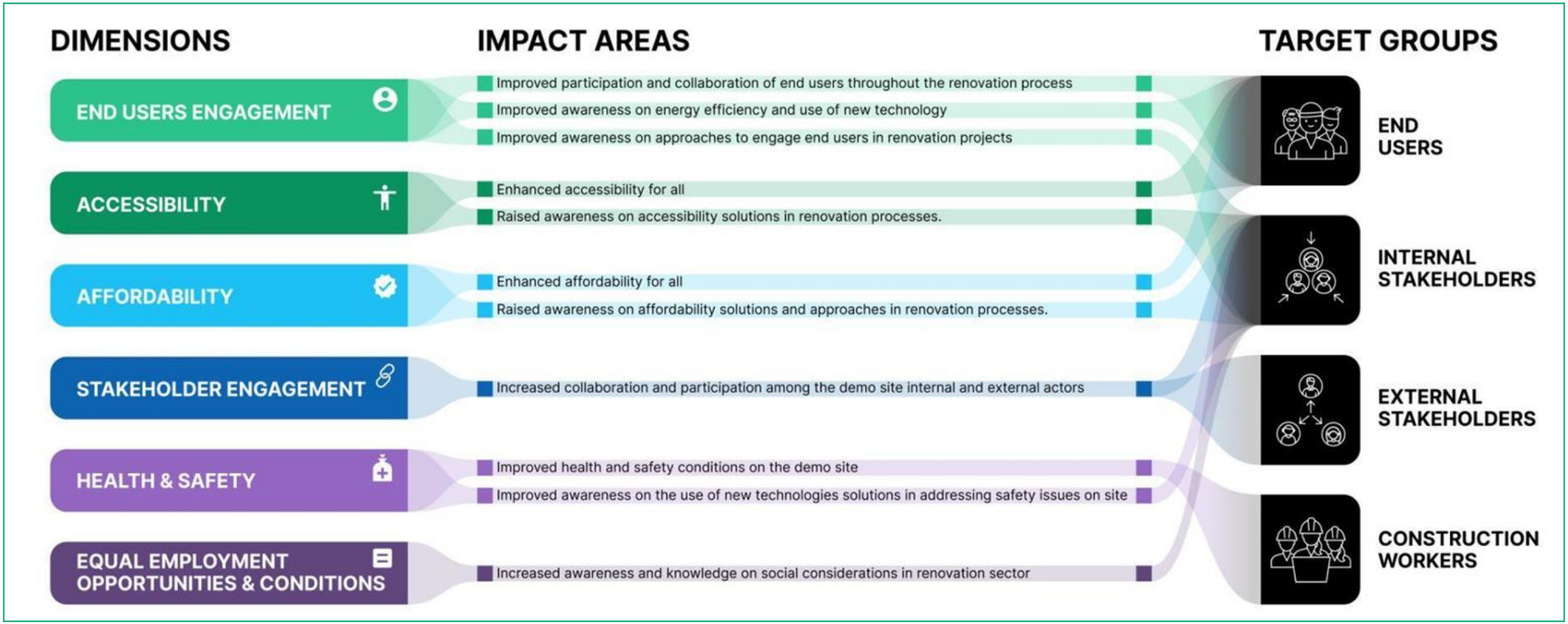
Social Inclusion in Deep Renovation – Recognition Justice

Goal

Recognising that different groups face different constraints, capabilities, and starting conditions in renovation processes.

Key elements	Examples in deep energy renovation
Recognition of vulnerable groups	• Identify energy-poor households, elderly residents, and tenants at risk • Consider socio-economic and cultural diversity in housing
Mapping lived experience	• Understand residents' energy practices and comfort needs • Acknowledge the potential performance gap caused by the mismatch between complex tech and user capability
Recognition of residents' perspectives	• Integrate residents' lived experiences in renovation planning • Ensure local knowledge informs renovation solutions

InCUBE Social Inclusion Framework



Social Inclusion Recommendations – during renovation

End User Engagement

- Clear two-way communication with residents
- Collect regular user feedback
- Provide guidance and administrative support
- Minimise disruption during renovation
- Raise awareness of energy efficiency

Stakeholder Engagement

- Maintain continuous coordination among stakeholders
- Communicate renovation progress and key milestones

Accessibility

- Improve accessibility during renovation following universal design

Health & Safety

- Ensure compliance with safety regulations
- Ensure safety and hygienic conditions for the residents

Affordability

- Improve transparency in financial decisions to build trust and promote fair handling of funds among actors

Equal employment opportunities

- Raise awareness to cultivate an inclusive work environment that offers equal opportunities for all

Social Inclusion Recommendations

Dimension	Recommendation
End User Engagement	Establish a **comprehensive communication strategy** to facilitate effective two-way communication between the renovation team and the end users, **ensuring timely and transparent sharing of information** regarding the renovation process.
	Collect **regular feedback** from the end users to enhance the renovation process and improve **overall user satisfaction.**
	Provide **continuous guidance and administrative support** to end users related to the renovation process.
	Minimise disruptions related to the renovation work on-site to **reduce user discomfort.**
	Improve awareness of energy efficiency and use and maintenance of new InCUBE technology/solutions to **enhance user acceptance.**
Stakeholder Engagement	Ensure **continuous communication** among all stakeholders for smooth coordination and execution of renovation works.
	Regularly **communicate the renovation progress or key milestones to the external stakeholders** to enhance engagement and transparency.
Accessibility	Enhance **physical accessibility** during renovation works based on universal design principles.
Affordability	Improve **transparency in financial decisions** to build trust and promote fair handling of funds among actors during and after the renovation works.
Health & Safety	Ensure **compliance with safety regulations** and maintain hygienic conditions on-site to create a secure and inclusive working environment.
	Ensure **safety and hygienic conditions** for the residents of the building during the renovation works.
Equal employment opportunities & conditions	Raise **awareness to cultivate an inclusive work environment that offers equal opportunities** for all employees, promotes diversity, and maintains transparency, thereby fostering a fair and open work culture where everyone feels valued and welcomed.

Operational tips – End User Engagement

1. Establish a comprehensive communication strategy to ensure effective two-way communication with end users

- Develop a structured communication plan with clear timelines and responsibilities
- Provide regular updates on renovation progress and expected disruptions
- Use multiple communication channels to reach diverse user groups
- Ensure information is accessible, clear, and non-technical

2. Collect regular feedback from end users to enhance the renovation process

- Conduct periodic surveys during renovation
- Organise feedback sessions or open meetings
- Establish an accessible feedback mechanism for urgent concerns
- Analyse feedback systematically and adjust processes accordingly

3. Provide continuous guidance and administrative support to end users

- Offer assistance in understanding renovation timelines and procedures
- Support users with administrative paperwork related to renovation
- Provide contact points for technical or financial questions
- Develop FAQs or guidance materials

4. Minimise on-site disruptions to reduce user discomfort

- Provide advance notice of disruptive activities
- Schedule high-impact works strategically
- Implement mitigation measures for noise and dust
- Maintain safe and accessible entry points

5. Improve awareness of energy efficiency and new technologies

- Organise information sessions on InCUBE technologies
- Provide user manuals and maintenance guidance
- Offer demonstrations of installed solutions
- Develop awareness material on long-term energy savings

Operational tips – Stakeholder Engagement

1. Ensure continuous communication among all stakeholders for smooth coordination

- Organise regular coordination meetings at consistent intervals
- Conduct a pre-construction alignment session to clarify roles and expectations
- Establish dedicated communication channels for real-time updates
- Use structured feedback tools during renovation
- Update the stakeholder matrix when new actors join
- Conduct regular joint site visits
- Integrate social inclusion clauses into tender specifications

2. Regularly communicate renovation progress and milestones to external stakeholders

- Prepare periodic milestone reports
- Share progress updates through formal communication channels
- Organise public briefings or stakeholder updates
- Ensure transparency regarding delays or adjustments
- Maintain clear documentation of decisions and changes

Operational tips – Accessibility

1. **Enhance physical accessibility during renovation works**

- Apply universal design principles in planning
- Ensure barrier-free access during and after renovation
- Maintain accessible routes during construction
- Adapt signage for clarity and inclusiveness
- Consider mobility needs of elderly and disabled users

Operational tips – Affordability

1. **Improve transparency in financial decisions during and after renovation**

- Clearly communicate cost breakdowns to relevant actors
- Provide information on subsidies and financial support
- Ensure transparency in allocation of renovation funds
- Monitor cost overruns and communicate adjustments
- Clarify long-term operational cost expectations

Operational tips – Health & Safety

1. Ensure compliance with safety regulations and hygienic conditions on-site

- Conduct regular safety audits
- Provide proper protective equipment
- Monitor compliance with labour regulations
- Implement risk reporting mechanisms
- Ensure adequate training on safety procedures

2. Ensure safety and hygienic conditions for residents during renovation

- Separate construction zones clearly
- Maintain clean and secure common areas
- Communicate safety protocols to residents
- Monitor air quality and dust levels
- Provide emergency contact information

Operational tips – Equal Employment Opportunities & Conditions

1. **Raise awareness to cultivate an inclusive work environment**

- Promote inclusive recruitment practices
- Ensure appropriate protective equipment for all workers
- Provide training opportunities on new technologies
- Encourage diversity and gender balance
- Promote transparency in career development pathways
- Monitor labour conditions

Section 2: Gender Impact Matrix

Key Statistics

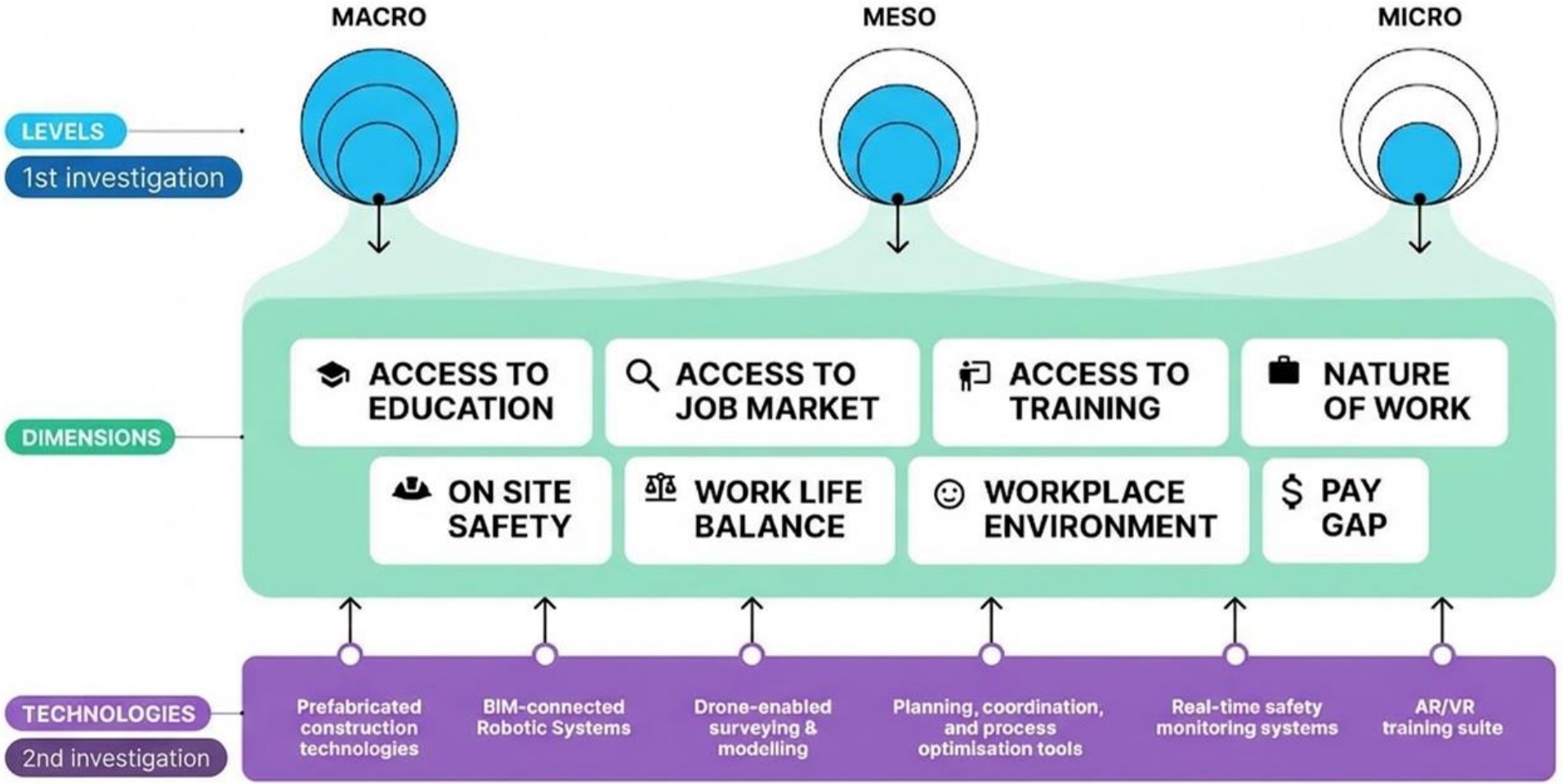
10% of the **EU construction workforce** in the third quarter of 2021 were women, indicating persistent underrepresentation in the sector (Eurostat, 2022).

2% of **skilled on site construction workers** in 2021, including bricklayers, roofers, and insulation workers, were women, highlighting a sharper gender gap in manual occupations (Cedefop, 2023).

24% of the **EU energy sector workforce** in 2022 were women, showing a sizeable but less pronounced gender imbalance compared to construction (Eurostat, 2023).

- Labour shortages in construction have **nearly tripled over the past decade**, reaching significantly higher levels in 2023 compared to ten years earlier, with low sector attractiveness identified as a key driver.
- Meeting EU Green Deal and Recovery and Resilience Plan targets is expected to generate **between 1 and 2.5 million new construction jobs by 2030**, increasing demand for a skilled workforce.
- Sectoral transitions, including digitalisation, are seen as an opportunity to create **more qualified jobs for women and young people**, provided that inclusion is actively promoted.
- The Pact for Skills in Construction, under the EU Skills Agenda, aims to **upskill and reskill 30% of the construction workforce annually by 2030**, while attracting more women and young people to the sector.

InCUBE Gender Impact Framework



InCUBE Gender Impact Framework

Dimensions for GIM	Gender-related barriers or issues
Access to education	• Gender stereotypes about STEM professions limit girls' interest, engagement, and achievement from an early age. • Lack of female role models in the industry impacts girls' aspirations. • The sector's perception as a male-dominated field deters women from considering careers in these areas. • Barriers to educational access include societal expectations, lack of awareness, and limited support for non-traditional career paths.
Access to job market	• Unconscious gender biases during recruitment favor male candidates. • Lack of internship and mentorship opportunities reduces women's entry points. • Inadequate gender-sensitive recruitment practices hinder equal job access.
Access to training	• Limited training and skill development opportunities for women due to workplace biases. • Lack of mentorship further restricts women's professional growth. • Fewer development programs targeting women
Nature of work	• Women are often concentrated in administrative roles rather than technical or managerial positions • Lack of flexible working options
On site safety	• Inadequate access to appropriately sized tools and PPE designed for women. • Lack of appropriate on-site facilities like changing rooms and washrooms. • Inadequate training on workplace safety that addresses gender-specific concerns • Lack of protocols to address or report harassment or unsafe behavior in the workplace
Work life balance	• Lack of flexible working conditions
Workplace environment	• Workplace discrimination, harassment, and a hostile work environment in male-dominated sector
Pay gap	• Women earning less than their male counterparts for the same work. • Negotiation differences • Gender bias in salary setting • Lack of pay transparency

Structure of Gender Impact Matrix

In the **first investigation**, the **GIM examines key challenges perceived by professionals** in the sector, integrating gender dimensions across three professional levels: macro, meso, and micro.

- **Macro-level roles** represent professionals working within institutions such as public authorities, universities, or research organisations. They focus on shaping policies, setting industry standards, and developing new knowledge that influences the sector at a strategic and systemic level.
- **Meso-level roles** represent professionals in private enterprises or non-governmental organisations, such as architectural firms, construction companies, manufacturing companies, or technology providers. They contribute to implementing, managing, and supporting construction and renovation processes.
- **Micro-level roles** represent professionals directly engaged in on-site construction activities. This includes construction workers, site personnel, and supervisors whose primary responsibilities involve the execution, monitoring, and management of daily renovation tasks.

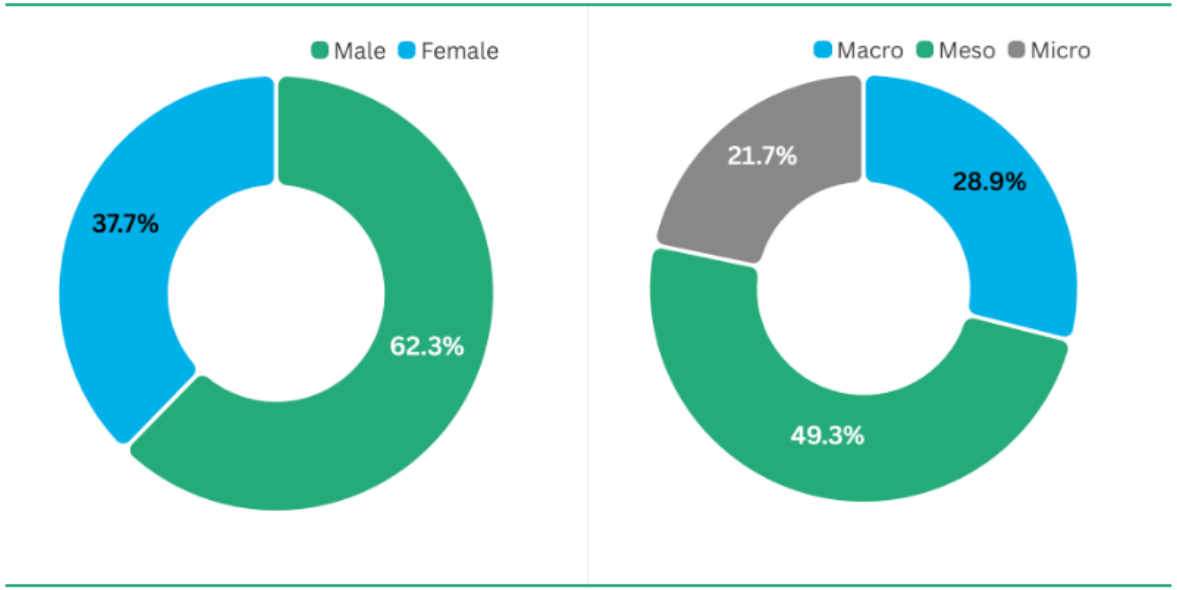
Structure of Gender Impact Matrix

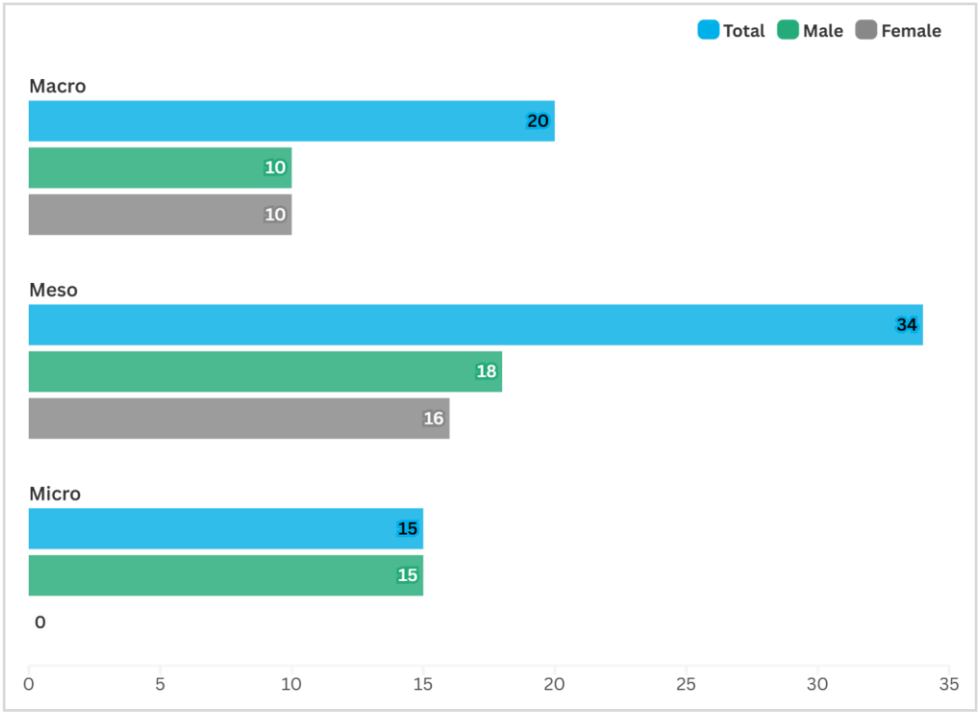
The **second investigation** applies the GIM to assess the **potential of innovative technologies to improve gender inclusion.** Alongside the identified dimensions, the framework incorporates key InCUBE technologies. These were selected collaboratively with project partners as the most relevant solutions within the project, based on their capacity to address gender-specific barriers across the identified dimensions. The selected technologies are:

1. **Prefabricated construction technologies**
   - Modular Facades
   - BIPV pre-installed on prefab facades
2. **BIM-connected Robotic Systems**
   - Drilling & Demolition robot
3. **Drone-enabled surveying & modelling**
   - Drone-enabled Scan-to-BIM 3D modelling
   - 3D reality-based surveying and 3D modelling
4. **Planning, coordination, and process optimisation tools**
   - IPD, A3 and LPS – driven Rehabilitation
   - Job scheduling optimiser
   - Lean construction platform
5. **Real-time safety monitoring systems**
   - PPE Monitoring System
   - Anti-Collision System
   - Resilience dashboard
6. **AR/VR training suite**

Insights from First investigation – Profile

- Number of participants = **69**
- **Gender composition** – 43 participants (62.3%) were male, while 26 (37.7%) were female
- **Sector composition** – 20 respondents (29%) belong to macro-level institutions; 34 participants (49.3%), are affiliated with meso-level organisations and 15 respondents (21.7%) belong to the micro-level category





Insights from First investigation

Across all dimensions, **women consistently report a higher prevalence of barriers than men**, indicating marked gender differences in how challenges are experienced or recognised within the sector.

- There is broad agreement across genders that barriers exist for women to access technical and managerial roles within the sector.
- Workplace Hostility: 46% of female respondents reported encountering or observing workplace discrimination or hostility, compared to 9% of male respondents.
- Safety challenges: While safety challenges were reported by nearly half of male respondents (49%), the rate was significantly higher for female respondents (81%).
- Recruitment bias: 42% of women reported personally facing gender-related biases during recruitment, compared to 19% of men.
- Perception of pay equity: There is a notable difference in how the pay gap is interpreted. 58% of women attribute the pay gap to gender bias in salary setting, whereas 19% of men share this view.

Dimensions		Total (n=69)	Male (n=43)	Female (n=26)
Nature of work	Perceived barriers to women's access to technical and managerial roles	94%	91%	100%
Access to education	Challenges faced in accessing education	65%	60%	73%
On-site safety	Experienced safety-related challenges	61%	49%	81%
Access to training	Barriers faced to access training or skill-building initiatives	59%	51%	73%
Work-life balance	Barriers faced to access flexible working arrangements	42%	40%	46%
Pay gap	Perception that gender bias in salary setting contributes to pay gap	33%	19%	58%
Access to job market	Gender-related biases faced during recruitment	28%	19%	42%
Workplace environment	Encountered or observed incidents of workplace discrimination or hostility	23%	9%	46%

Insights from First investigation

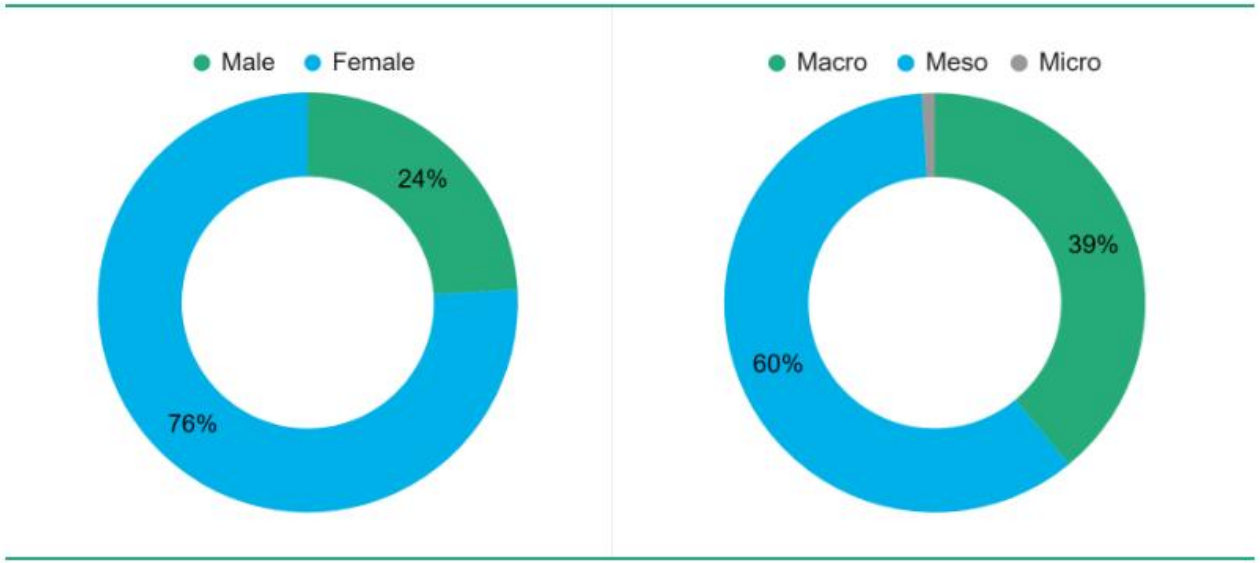
The prevalence of reported challenges varies according to the respondent's work environment

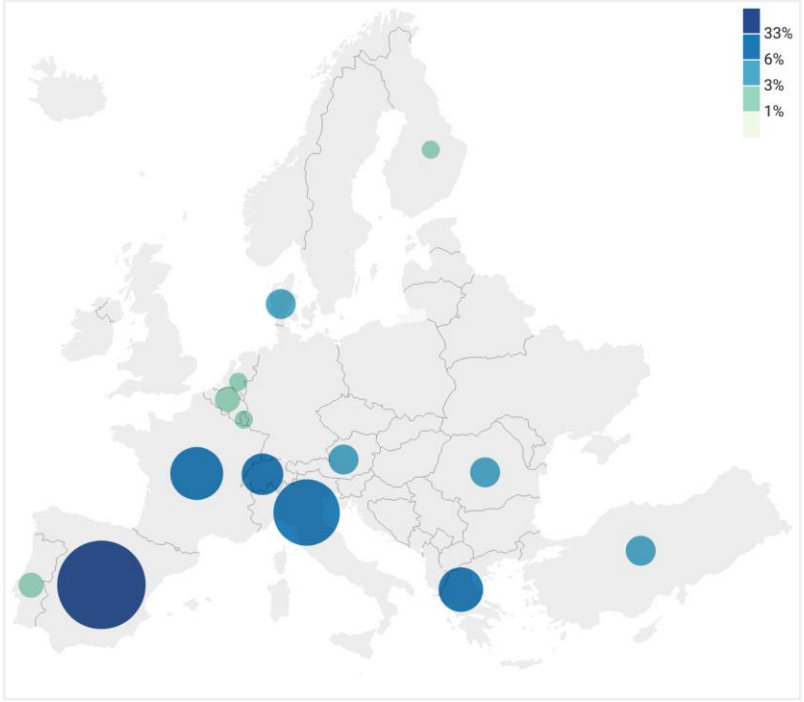
- **Macro-level:** Respondents from macro-level environments reported the highest incidence of several key challenges, specifically safety-related challenges (75%) and barriers to accessing training (70%).
- **Meso-level**: This group reported the highest perceived barriers to entry, with 97% noting barriers to technical roles and 74% noting challenges in accessing education.
- **Micro-level:** Respondents were all male at this level and reported the lowest frequency of challenges across almost all indicators. Notably, 0% of respondents in this group reported observing workplace discrimination or hostility, and they reported the lowest rates of recruitment bias (13%). These figures likely reflect the total exclusion of women from these on-site environments rather than a lack of bias.

Dimensions		Total (n=69)	Macro (n=20)	Meso (n=34)	Micro (n=15)
Nature of work	Perceived barriers to women's access to technical and managerial roles	94%	95%	97%	87%
Access to education	Challenges faced in accessing education	65%	65%	74%	47%
On-site safety	Experienced safety-related challenges	61%	75%	65%	33%
Access to training	Barriers faced to access training or skill-building initiatives	59%	70%	59%	44%
Work-life balance	Barriers faced to access flexible working arrangements	42%	45%	44%	33%
Pay gap	Perception that gender bias in salary setting contributes to pay gap	33%	30%	41%	20%
Access to job market	Gender-related biases faced during recruitment	28%	35%	29%	13%
Workplace environment	Encountered or observed incidents of workplace discrimination or hostility	23%	35%	27%	0%

Insights from Tech4EU Construction Cluster

- **87 participants** from the Tech4EU projects – BEEYONDERS, ROBETARME, and HUMANTECH
- Respondent group was predominantly female, with **66 women (76 %) and 21 men (24 %).**
- Respondents were **geographically diverse**, Spain represented the largest share of participants (33 %), followed by Italy (18 %) and France (11 %).
- Strong presence of individuals (60%) working at operational roles (construction companies, architect firms, technology providers, etc.) within the sector.

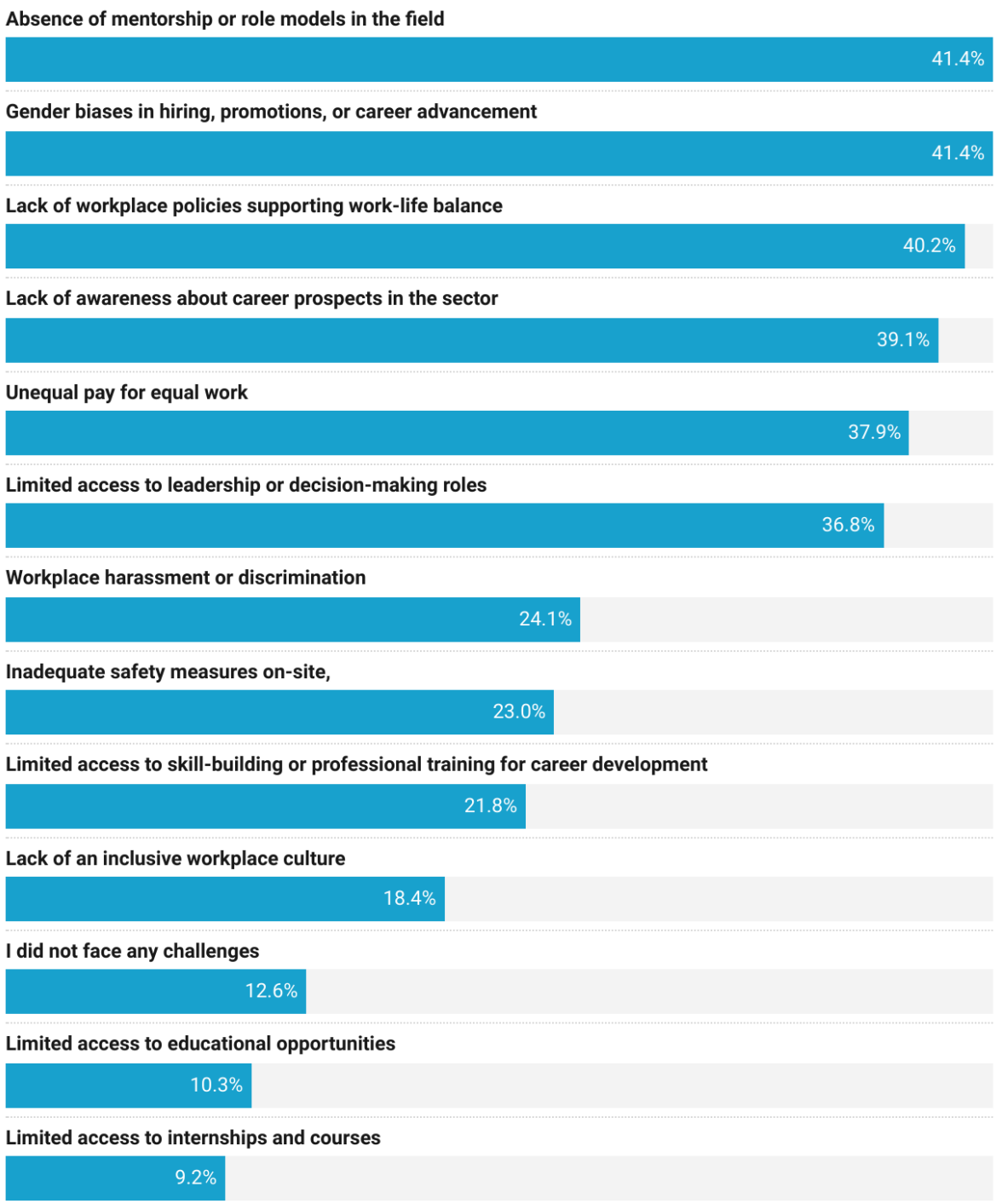




Insights from Tech4EU Construction Cluster

Top three barriers

1. The most frequently reported issues were the **absence of mentorship or role models** and **gender biases in hiring, promotions, or advancement**. These two challenges were reported at similarly high levels, indicating that guidance, representation, and equitable treatment remain central concerns.
2. **Lack of awareness about career prospects**, and
3. **Insufficient workplace policies supporting work-life balance** further highlight difficulties in navigating and sustaining careers within the sector.



Insights from Tech4EU Construction Cluster

Top three barriers – Female respondents

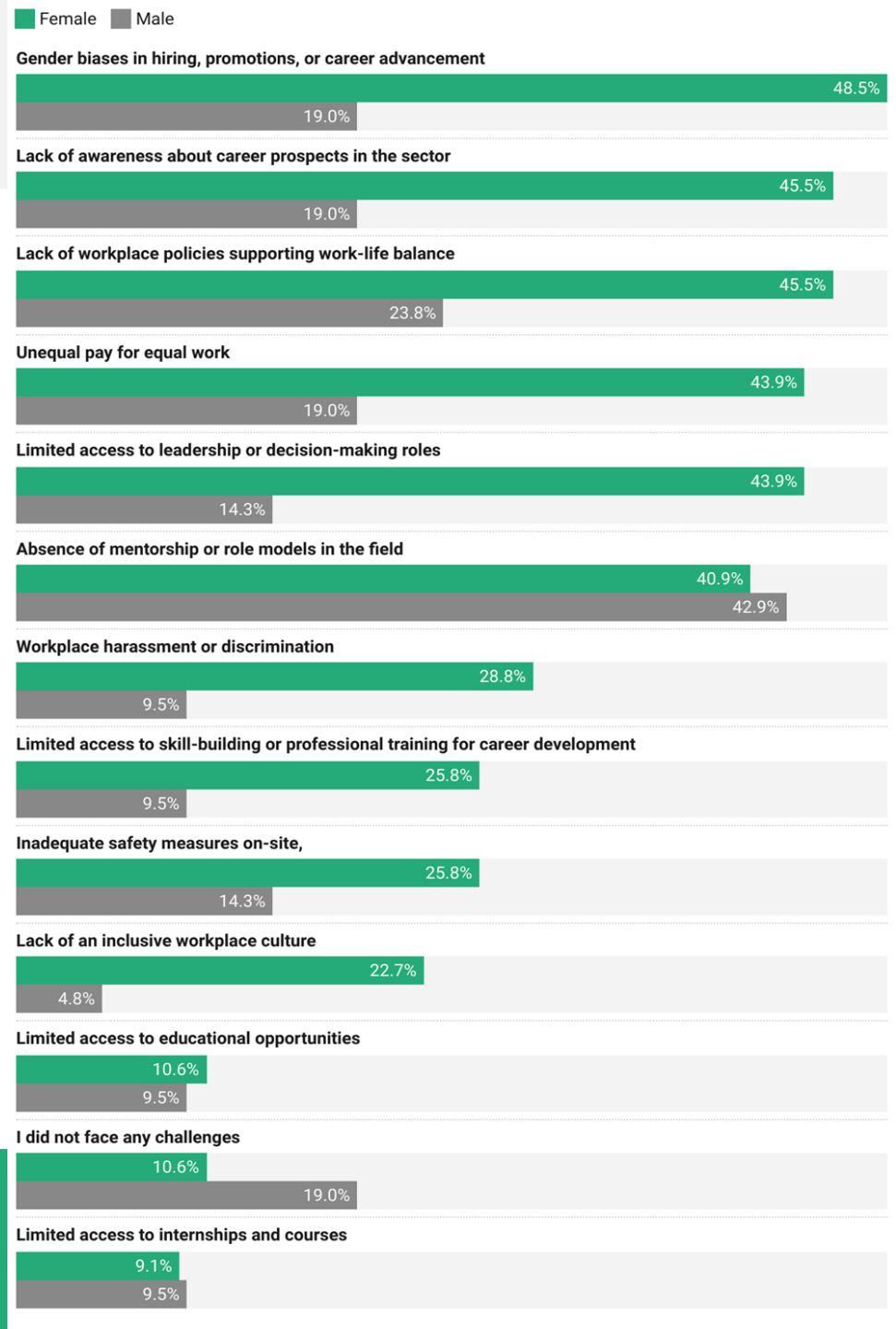
1. Gender bias in hiring, promotions, or career advancement.
2. Lack of awareness about career prospects and Insufficient workplace policies supporting work–life balance.
3. Unequal pay and limited access to leadership roles at similarly elevated levels.

The most frequently reported challenges therefore relate to **systemic inequalities and organisational barriers**.

Top three barriers - Male respondents

1. Absence of mentorship or role models, the only challenge reported at a level comparable to female respondents.
2. Lack of Work-life balance policies.
3. Unequal pay, gender bias in hiring or promotion, and lack of awareness about career prospects.

Overall, **male respondents reported lower levels across all challenge categories**, with the remaining barriers occurring **substantially less frequently**.



Insights from Tech4EU Construction Cluster

*"I have repeatedly **faced toxic behaviors from colleagues and supervisors** due to my shorter professional experience compared to theirs." - Female respondent*

*"When it is a woman giving the orders, it seems **hard for them to take her seriously,** and sometimes her knowledge or ability to address problems that may arise on the site is questioned." - Female respondent*

*"During my job search, I was directly **asked about potential plans to have children.** In meetings, I repeatedly experienced that my constructive suggestions were dismissed until a male colleague repeated them, at which point they were suddenly considered very good." - Female respondent*

*"When I worked in a construction company, I **encountered situations of verbal discrimination** from some specific colleagues. The work environment on-site was very masculinized and manners were often abrupt." - Female respondent*

*"In general, I think the s**ector is markedly masculine and sexist.** You don't see women leading any private companies. Working as a project technician, when contacting a company together with some of my male colleagues, they treated me like the secretary simply because of my sex instead of respecting my job position." - Female respondent*

Insights from second investigation

- Innovative technologies are perceived as **enabling instruments rather than transformative forces.** They are viewed as supportive tools that reduce physical strain, enhance workplace safety, and shift tasks towards digital and cognitive domains, thereby potentially broadening access to the sector.
- Technology is not inherently inclusive. Its introduction does not automatically challenge gender stereotypes or exclusionary workplace cultures. Meaningful inclusion requires parallel cultural and organisational change alongside technological innovation.
- Access to training, allocation of roles, career progression pathways, and decision making processes determine whether technological adoption mitigates or reinforces existing inequalities.

Dimensions		Prefabricated construction technologies (n=48)	BIM-connected Robotic Systems (n=42)	Drone-enabled surveying & modelling (n=36)	Planning, coordination & process optimisation tools (n=36)	Real-time safety monitoring systems (n=42)	AR/VR training suite (n=36)
Access to education	Potential to improve access to educational opportunities	0%	0%	0%	0%	0%	69%
Access to job market	Potential to improve access to and create new job opportunities	46%	62%	58%	0%	52%	58%
Access to training	Potential to support new digital and technical skill development	58%	50%	72%	0%	5%	50%
Nature of work	Potential to transform the nature of work	67%	57%	61%	47%	0%	0%
On-site safety	Potential to improve on-site safety conditions	60%	55%	47%	0%	83%	0%
Work-life balance	Potential to support work-life balance and job flexibility	29%	29%	17%	39%	64%	44%
Workplace environment	Potential to improve workplace culture	33%	0%	0%	75%	0%	0%
Pay gap	Potential to contribute to fairer and transparent pay structures	8%	19%	14%	0%	0%	0%

0% 50% 100%

Thank you!

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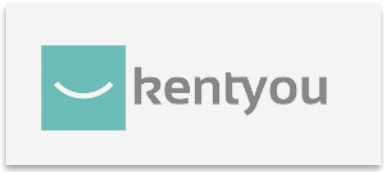
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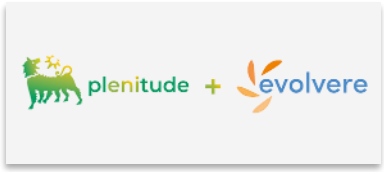
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