



# ChemSkills

Enabling the green and digital skills  
transformation of the chemical industry.

## Report on ChemSkills Survey Results 2<sup>nd</sup> iteration in Plastic

October 2025



Co-funded by  
the European Union

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# Executive Summary

ChemSkills is a European-funded project that aims to investigate and bridge the skills gaps arising from the ongoing digital and green transitions, aligning with the EU Chemicals Strategy for Sustainability. The project seeks to identify and develop the green and digital skills required in the chemical industry, enhance the quality of curricular and training programmes, and foster long-term cooperation among industry, education, and policy actors.

Addressing several sub-sectors of the chemical industry, including plastics, ChemSkills applies a coordinated research methodology under WP3 – Sectoral Skills Intelligence and Education Provision to identify existing and emerging skills needs. As part of this approach, a series of comprehensive surveys was developed under Task 5-10.1 and adapted to the specific characteristics of each subsector. The selected tool, EU Survey, provides a user-friendly and reliable platform that supports detailed visualisations and conditional question design, fully aligned with the project's objectives.

The current activity presents the analysis of the second iteration of the survey foreseen within the project framework. This new round of data collection aims to update and refine the findings from the first iteration, providing a deeper understanding of evolving workforce needs, particularly those related to green and digital transformation.

For this second round, the plastics subsector focused on understanding the nature of existing green and digital skills gaps and how these transformations influence the profiles sought when hiring new employees, with specific attention to both blue- and white-collar workers. The survey also investigated how digitalisation affects production processes, data management, and workforce upskilling needs. Moreover, it explored the current educational offer, examining the type of partnerships industries maintain with academia and identifying which skills are not yet adequately addressed in higher education programmes.

To maximise outreach and stakeholder engagement, the survey was disseminated through multiple channels, including direct email communication by stakeholders, social media, and internal newsletters. This combined strategy ensured broad participation and meaningful input across the value chain, reinforcing the project's mission to align training and skills development with the evolving needs of the European chemical industry.

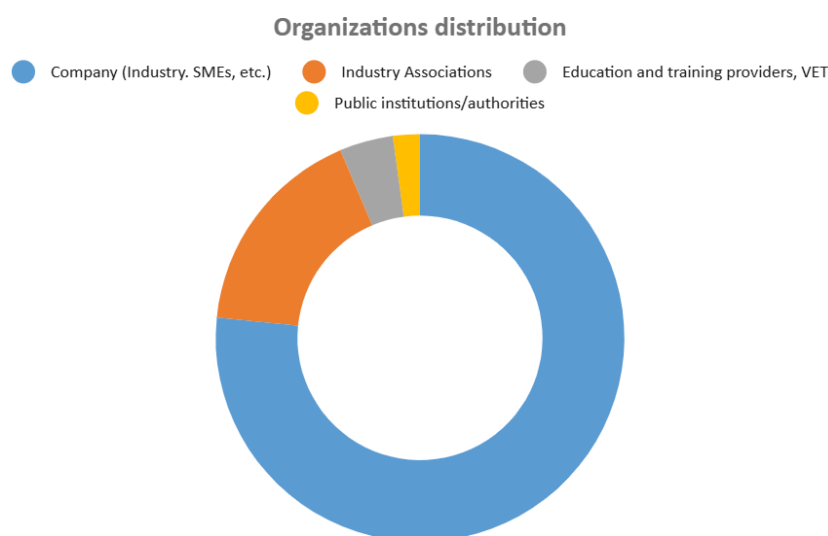
In total, the survey collected 108 responses across all chemical subsectors involved in the project, 45 of which (41.7 %) came from the plastics subsector.

## 1. Identification of Respondents

The respondent profile of the plastics subsector survey reflects a broad and diverse participation across Europe, although the dataset remains primarily industry-driven and dominated by medium and large enterprises.

### Type of Organisation

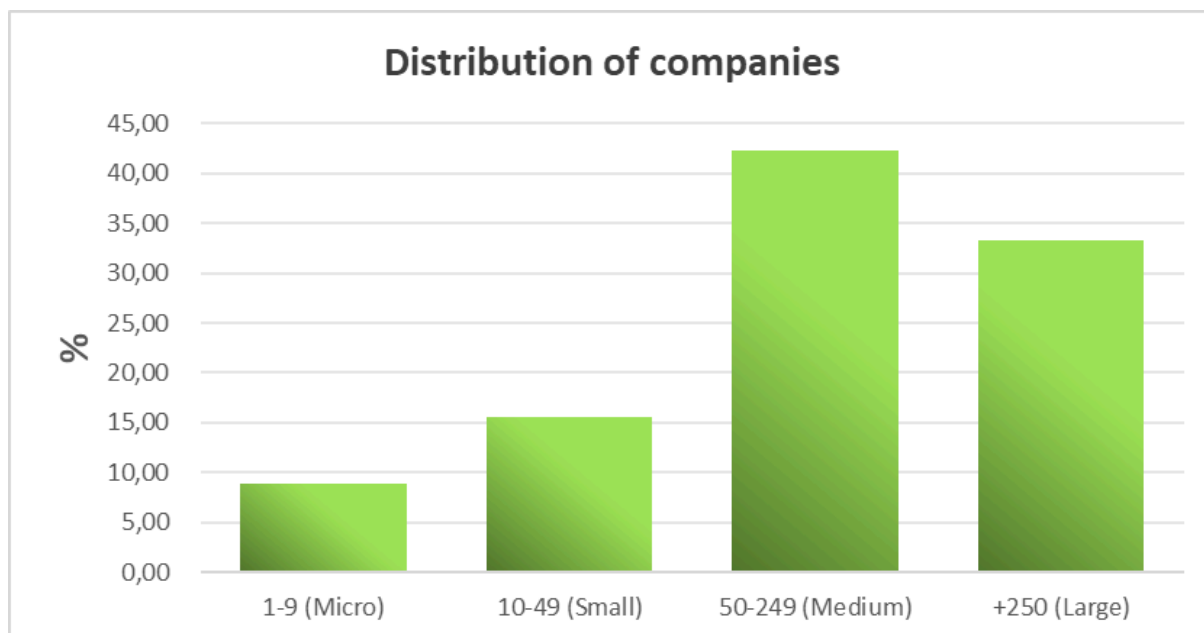
The majority of respondents (36 out of 45; 80%) represent companies (industry, SMEs, etc.), confirming the strong engagement of the private sector and ensuring that the survey findings accurately reflect the operational realities and skill needs of businesses active in the plastics value chain. Industry associations account for 8 responses (17.8%), contributing a valuable collective viewpoint and helping to contextualise company-level insights. A smaller number of responses were received from education and training providers (2; 4.4%) and public institutions or authorities (1; 2.2%).



*Figure 1: Organizations distribution*

### Organisation Size

The analysis of respondents by organisation size shows a predominance of medium and large enterprises, which together represent 75.5% of the total sample. Specifically, medium-sized organisations (50–249 employees) account for the largest share with 42.2% (19 responses), followed by large organisations (250+ employees) with 33.3% (15 responses). Small enterprises (10–49 employees) represent 15.6% (7 responses), while micro enterprises (1–9 employees) constitute 8.9% (4 responses) of the sample.



*Figure 2: Distribution of companies*

### **Geographical Distribution**

Respondents operate across a wide geographical spectrum, covering 27 EU member states and several non-EU countries. The most represented countries include Sweden (12 responses), Croatia (9), Germany (9), Slovenia (7) and Hungary (7), followed by Austria, Belgium, Italy, and the Netherlands (6 each). This broad distribution highlights the survey's strong coverage across Central and Northern Europe, with additional representation from Southern and Eastern European countries such as Spain, Romania, Poland, and Czechia.

A smaller number of responses were also received from countries including Finland, Latvia, Portugal, Bulgaria, Lithuania, Luxembourg, Slovakia, Cyprus, Greece, Malta, Denmark, Estonia and Ireland, each contributing one or two responses. Moreover, three respondents operate outside the EU, in regions such as the United States, Mexico, Brazil, India, China, Turkey, and the United Kingdom, reflecting the international reach and interconnectedness of the plastics industry.

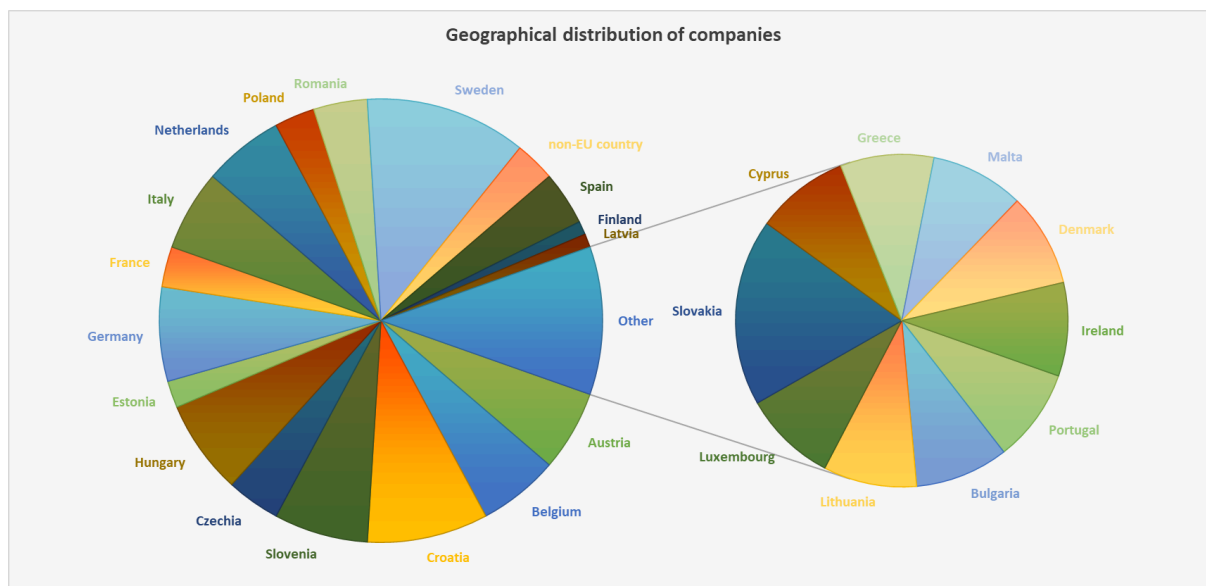
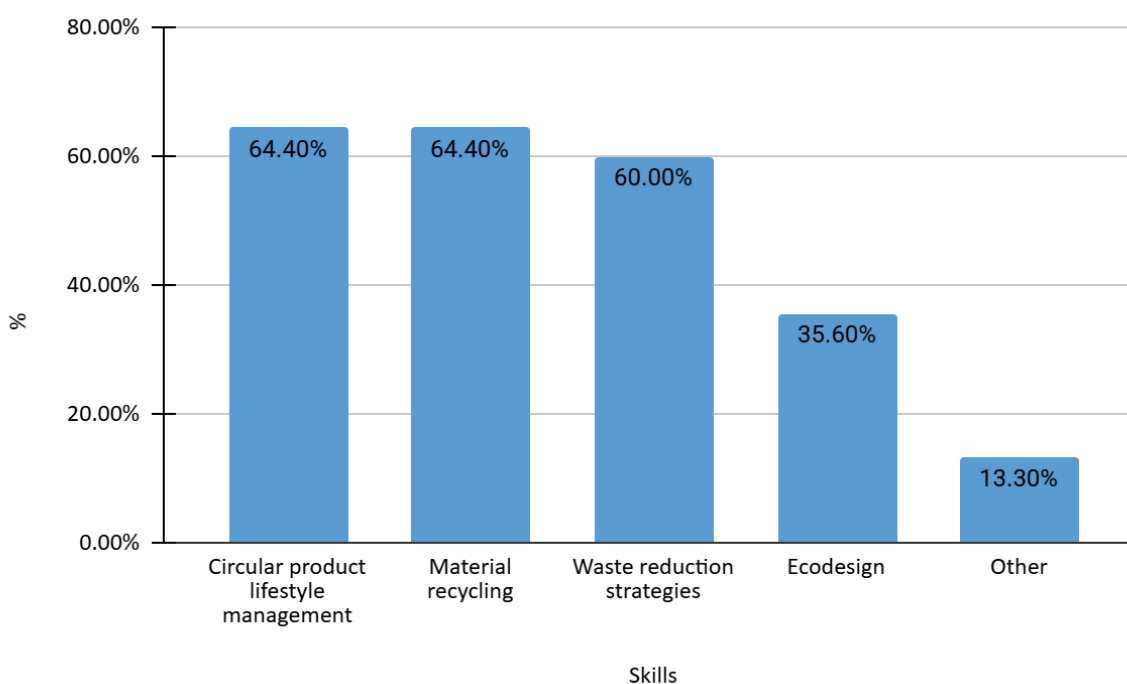


Figure 3: Geographical distribution of companies

## 2. Green Skills

### Specific Skills Critical for Adoption of Circular Economy Principles

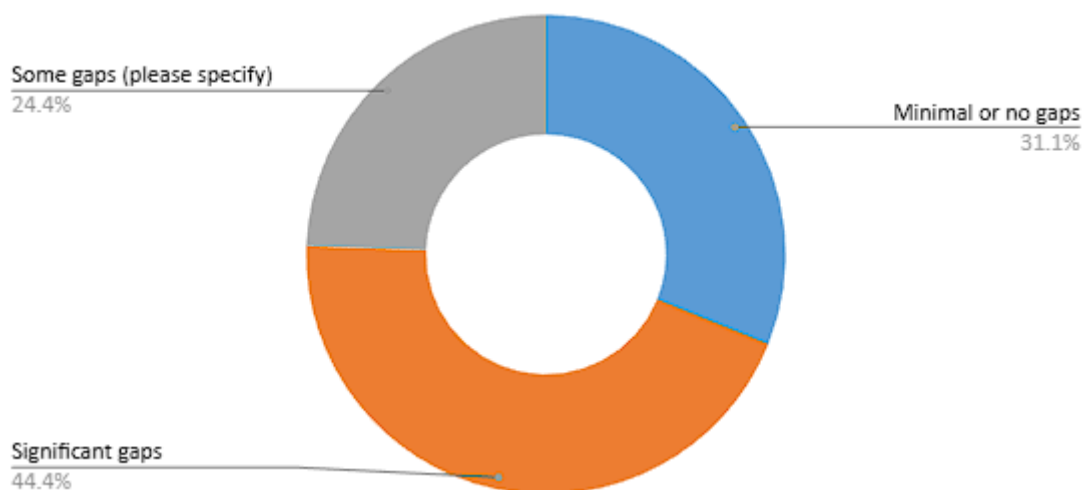
When asked which skills are most critical for implementing circular economy principles, respondents most frequently selected circular product lifecycle management (64.4%) and material recycling (64.4%), followed by waste reduction strategies (60%). Ecodesign accounted for 35.6% of responses, while other skills were mentioned less frequently (13.3%). These figures indicate a clear prioritisation of operational and lifecycle-focused capabilities within organisations. This analysis is based on multiple choice questions.



*Figure 4: Critical skills for circular economy principles*

### Green Initiatives-related Workforce Skills Gaps

Regarding workforce skill gaps related to green initiatives, 44.4% of respondents reported significant gaps, while 31.1% stated there are minimal or no gaps, and 24.4% indicated some gaps. The specified gaps most commonly referred to a lack of knowledge in sustainability reporting and regulatory updates, a limited understanding of industrial symbiosis and circular strategies, insufficient skills in renewable energy and energy efficiency, and a concentration of green-related knowledge primarily among management and technical staff rather than the wider workforce. Additional mentions included gaps in sales arguments for sustainability, material recycling knowledge, and a lack of supplier data.



*Figure 5: Gaps in workforce skills related to green initiatives*

### **Training Needed for Evolving Sustainability Regulations Compliance**

To remain compliant with evolving sustainability regulations, respondents most frequently identified the need for a better understanding of local and international regulations (62.2%) and circular economy implementation skills (57.8%), followed by training in reporting and compliance documentation (51.1%). A smaller share mentioned other needs (8.9%), such as data management tools, holistic approaches to material legislation, and better alignment of regulatory frameworks, while only 2.2% stated that no additional training is required as they are already compliant. This analysis is based on multiple choice questions.

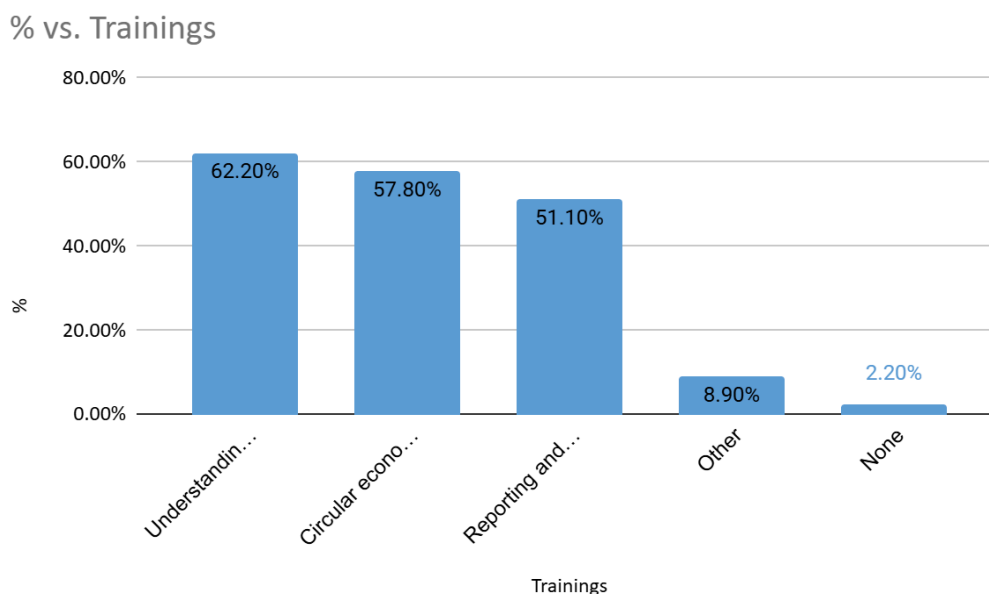


Figure 6: Training needed for evolving sustainability regulations compliance

### Sustainability Emphasis Influence on Skills Demand

When asked how sustainability priorities have influenced skill requirements in hiring or training, 40.0% of respondents reported a stronger emphasis on cross-disciplinary skills (such as combining engineering with sustainability knowledge), while 33.3% indicated no significant change. A shift toward legal or regulatory sustainability expertise and toward technical sustainability expertise was each noted by 11.1% of respondents. Other types of changes were mentioned by 4.4%.

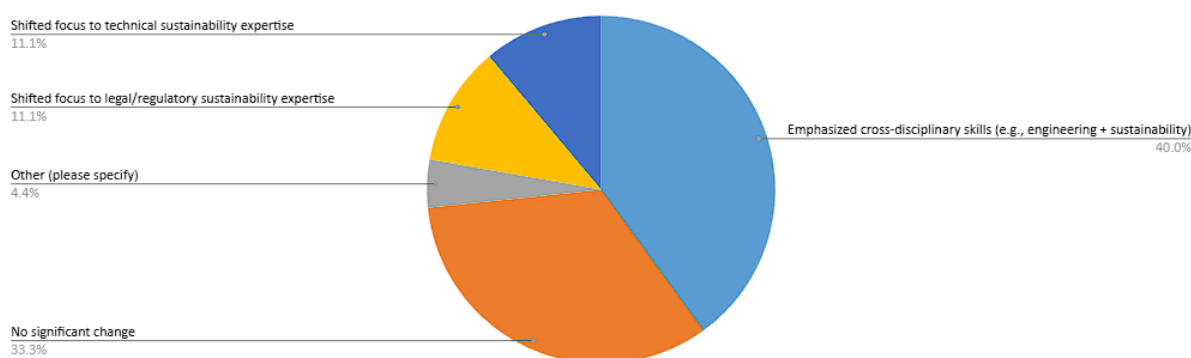


Figure 7: Influence of sustainability on skilled profiles

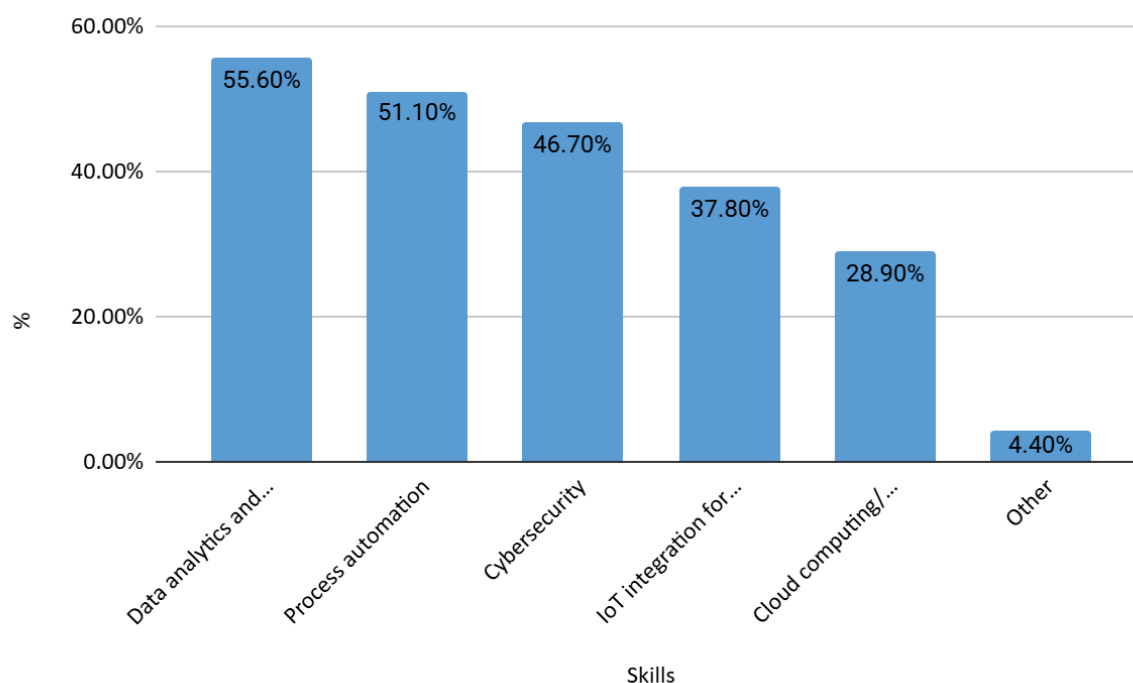
## 3. Digital Skills

### Digital Skills Critical for Adoption of Digital Solutions

In terms of digital skills needed for adopting digital solutions, data analytics and interpretation were the most frequently cited (55.6%), followed by process automation (51.1%) and

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cybersecurity (46.7% ). IoT integration for production monitoring accounted for 37.8% and cloud computing or digital infrastructure for 28.9% . Other skills were mentioned by 4.4%, specifically relating to digital product passports and the technical competencies required to support them, as well as skills for handling bureaucracy. This analysis is based on multiple choice questions.



*Figure 8: Digital Skills Critical for Adoption of Digital Solutions*

## Digital Skills Gaps

Regarding gaps in digital skills within the workforce, 37.8% of respondents reported significant gaps, 28.9% noted minimal or no gaps, and 33.3% indicated the presence of some gaps. The specified comments most commonly highlighted the uneven distribution of digital skills across employees, reliance on external partners, the need to adapt to new systems such as ERP, and a general need to strengthen daily digital competencies. Other mentions included challenges related to data analytics, AI usage, process optimisation through digitalisation, and insufficient ability to interpret and critically evaluate data.

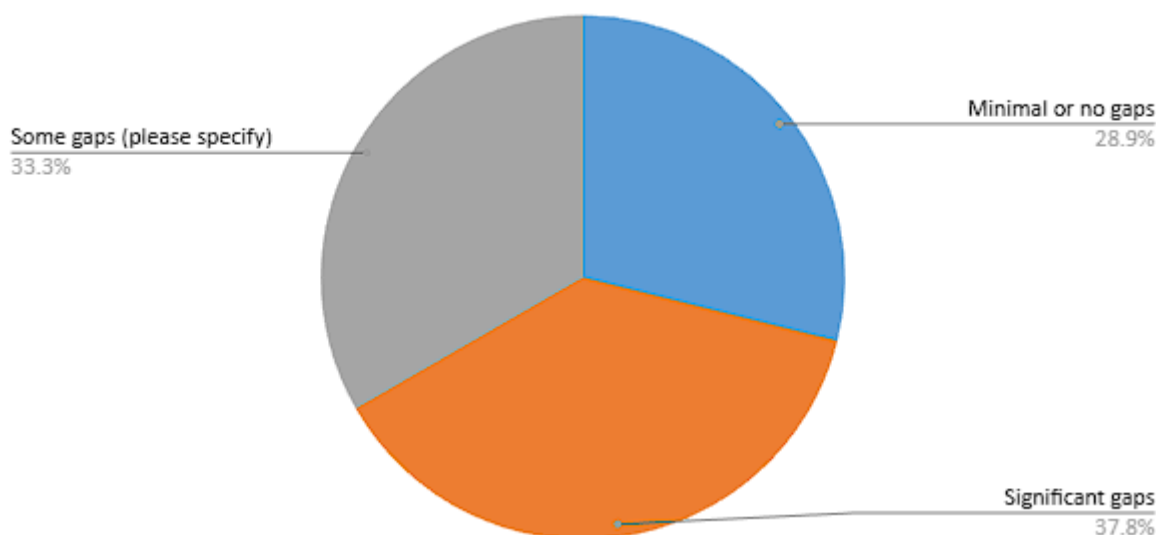


Figure 9: Digital Skills Gaps

### Digital Skills Needed for Evolving Digital Trends Compliance

To remain compliant with evolving digital trends, most respondents highlighted the need for understanding emerging digital technologies (75.6%) and digital transformation strategies (57.8%). Cybersecurity training was mentioned by 48.9% of respondents. Other training needs accounted for 4.4%, while only 2.2% stated no additional training is required, as they are already compliant. This analysis is based on multiple-choice questions.

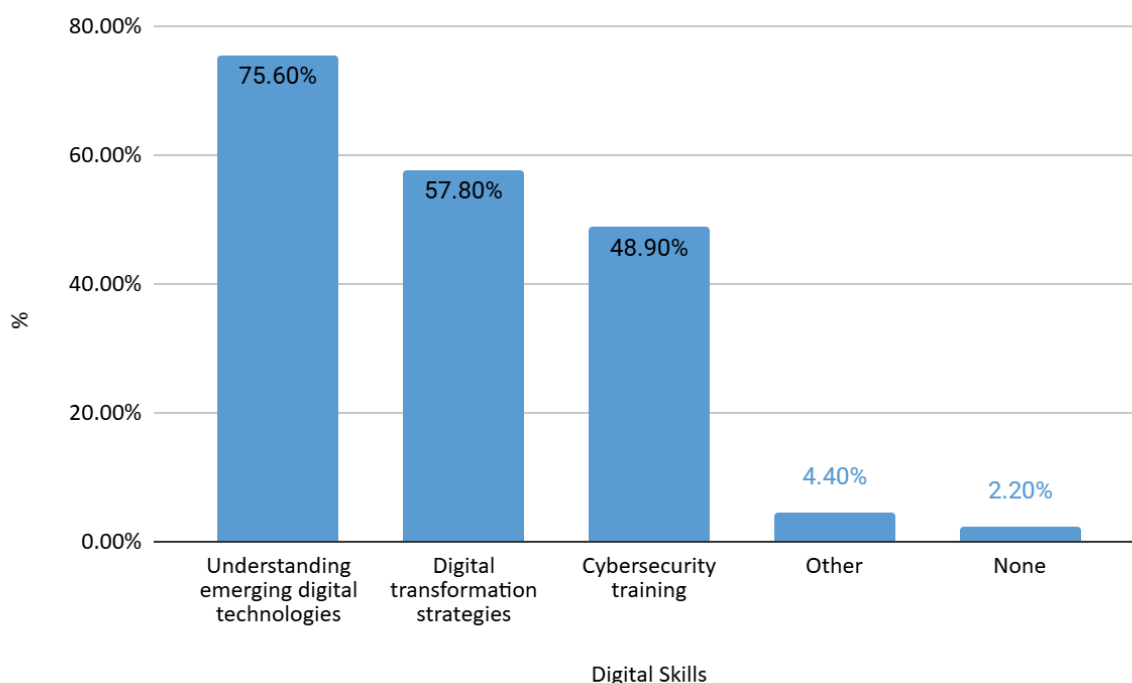


Figure 10: Digital Skills Needed for Evolving Digital Trends Compliance

### Skills needed to Leverage Advanced Digital Tech Impact

Robotics and automation were the most frequently mentioned (64.4%), followed by AI for material sorting (51.1%). Blockchain for traceability and IoT for production monitoring were both mentioned by 40% of respondents. Other technologies or needs were noted by 2.2%, including challenges related to managing increased administrative and regulatory requirements. This analysis is based on multiple-choice questions.

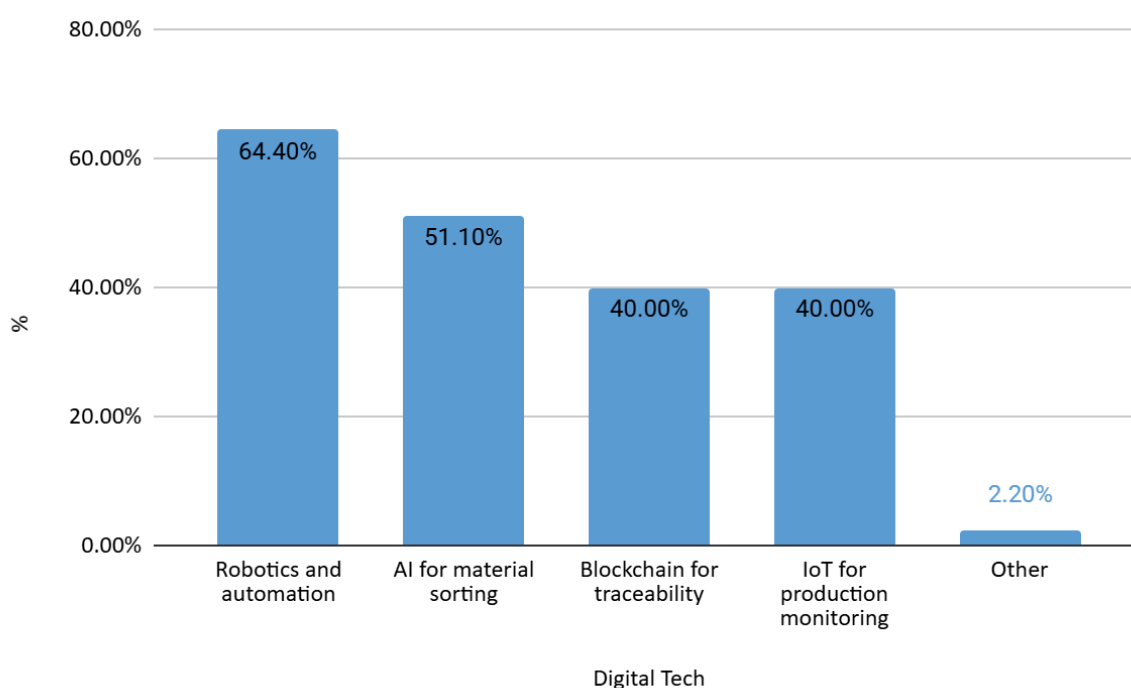
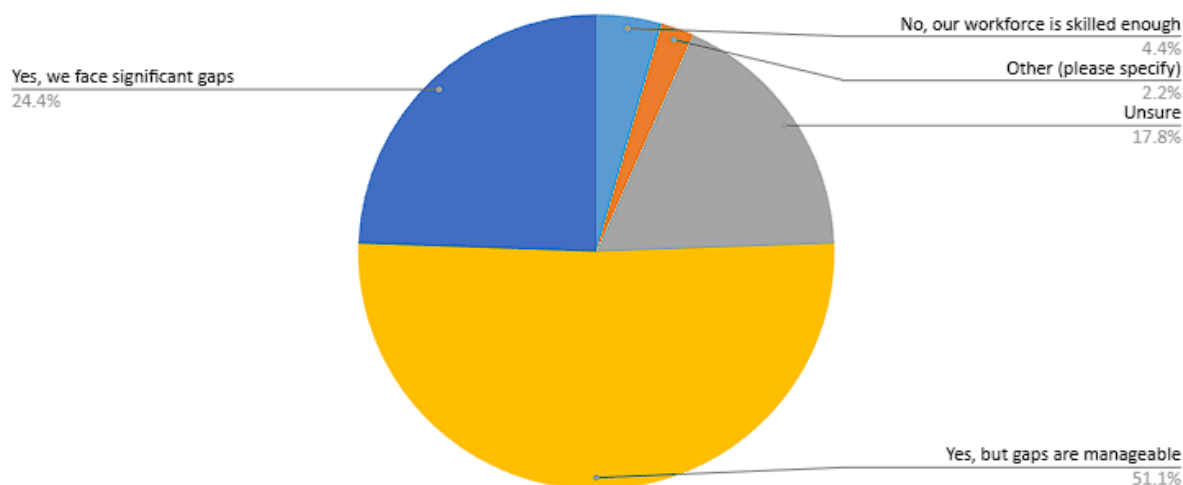


Figure 11: Skills needed to Leverage Advanced Digital Tech Impact

### Integrating Digital Technologies Skills Gaps

When asked about skill gaps in integrating advanced digital technologies, 51.1% of respondents stated that gaps exist but are manageable, while 24.4% reported significant gaps. A smaller share were unsure (17.8%), and only 4.4% indicated that their workforce is sufficiently skilled. Other responses accounted for 2.2%.

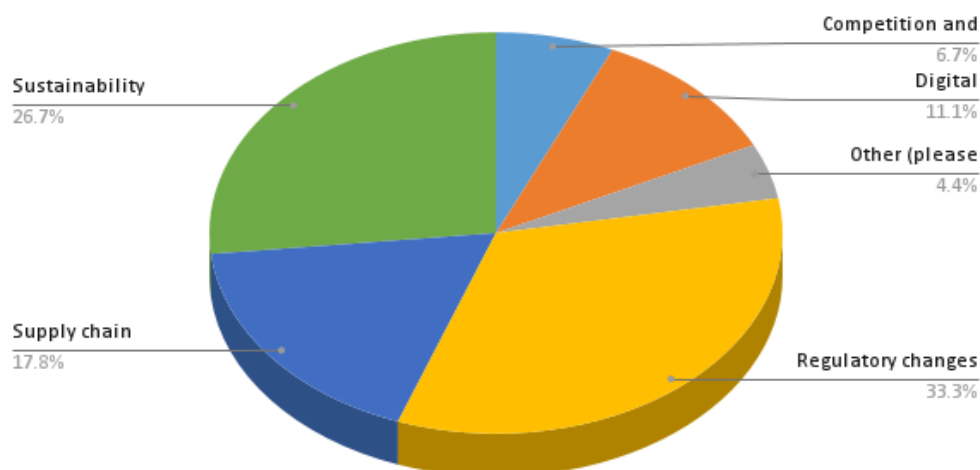


*Figure 12: Integrating Digital Technologies Skills Gaps*

## 4. Industry Trends and Challenges

To better understand how the chemical industry is overcoming the green and digital transition and how it influences the skills needed, we asked our companies a set of questions.

First, we wanted to know what the challenges are that impact the plastic industry the most. 33,3% of the companies chose regulatory changes as the most influential factor, followed by sustainability pressure (Figure 13). Lack of raw materials and supply chain disruption has an average influence on the sector, while digitalization and competition have only a minor impact.



*Figure 13: Challenges impacting the plastic industry*

When it comes to choosing future employees, half of the companies are choosing employees with cross-disciplinary skills e.g., IT and operations, while 31% of companies do not record significant change. Less than 20% shifted focus to technical digital expertise.

The industry is developing very fast, while universities and faculties are inert structures that do not update subjects and programs often and according to the sectoral needs. In fact, innovations in industry are pushed by R&D in industry and regulation, not by educational changes. The consequence of this is gaps between real sectoral needs and institutional skills and knowledge.

Regulatory/compliance knowledge gaps, insufficient digital skills, cross-disciplinary capabilities, and lack of technical skills are targeted as the most critical gaps, with a ratio from 28-38%, while sustainability expertise and regulatory/compliance knowledge gaps are scoring around 22-28% (Figure 14). This analysis is based on multiple-choice questions.

What are the most critical skill gaps that your organisation is currently facing?

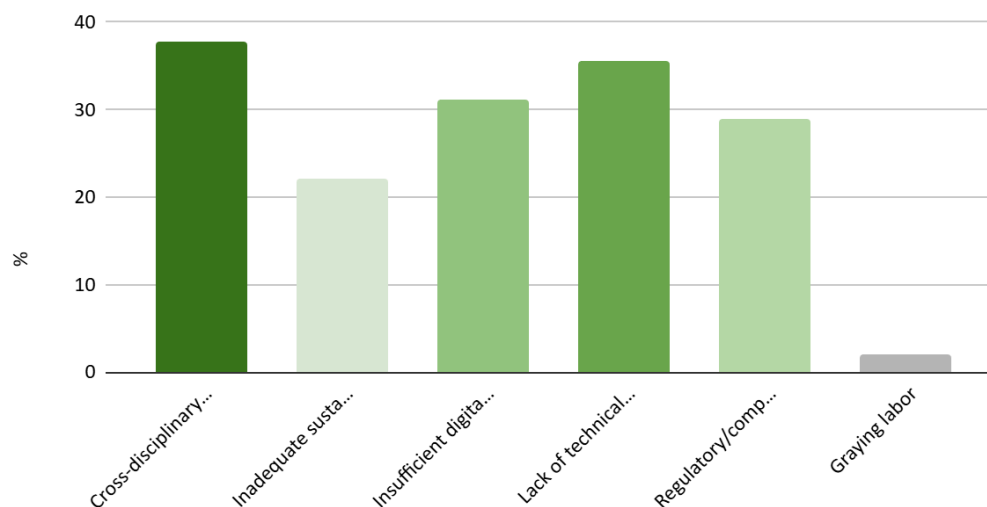


Figure 14: Overview of the most critical skill gaps in the plastic industries

Figure 15. illustrates the lack of expertise among employees. Production/manufacturing and R&D/Innovation are two areas that companies see as the highest lack of expertise among employees, with around a 55% score. 20% of companies detected a lack of expertise in the recycling of materials. Other categories like distribution, processing, and raw material sourcing are minor, less than 10%.

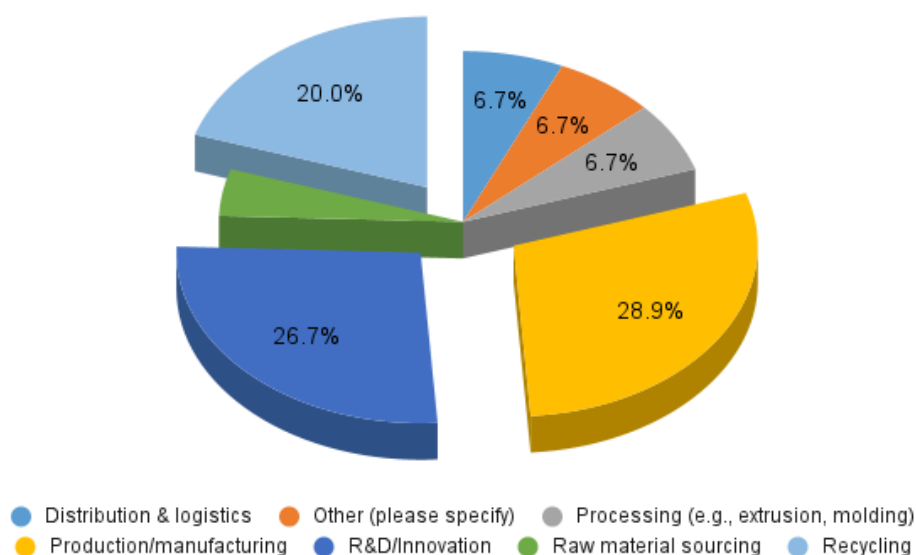
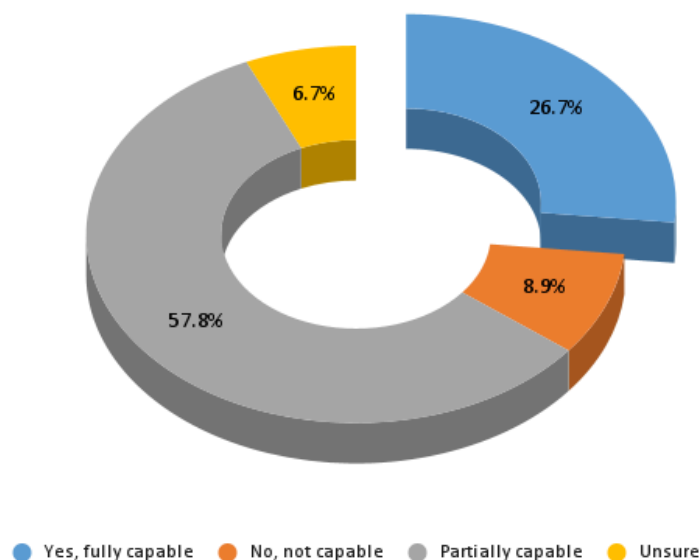


Figure 15: Lack of expertise among employees in the plastic value chain

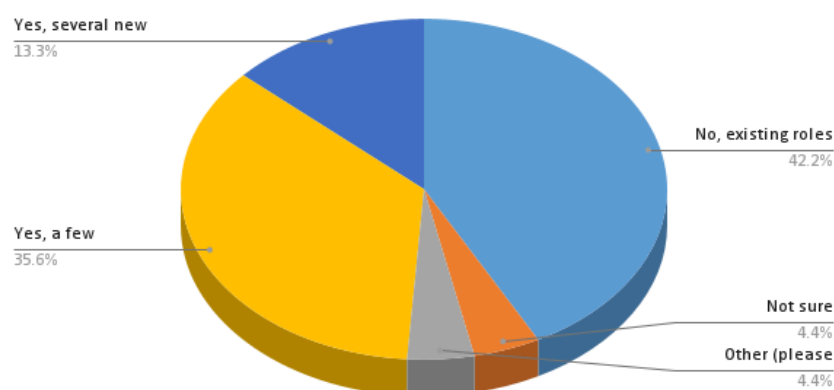
In an innovation ecosystem, there is one of the most important things - to be first among all and to take the lead in innovation. Companies today are under huge market pressure to constantly innovate and to be on track with all the regulations. To be on top sometimes

requires increasing capacity, either people or knowledge, or resources, but not all companies are capable of following, which can lead to the company's death. Of 45 companies that take part in the survey, only 12 (around 26%) are fully capable of following industrial innovations (Figure 16). A huge majority, around 58% of companies, are partly capable, while 16% are not capable or not sure about it.



*Figure 16: Capacity to follow industry innovations*

New trends and challenges require new job tasks and roles, but among companies, there is an equal percentage of companies that open new positions and hire new people (23 companies) and companies where existing roles are evolving in the next required (19 companies), as shown in Figure 17. Larger organizations are more likely to establish dedicated positions, while smaller ones adapt existing roles.

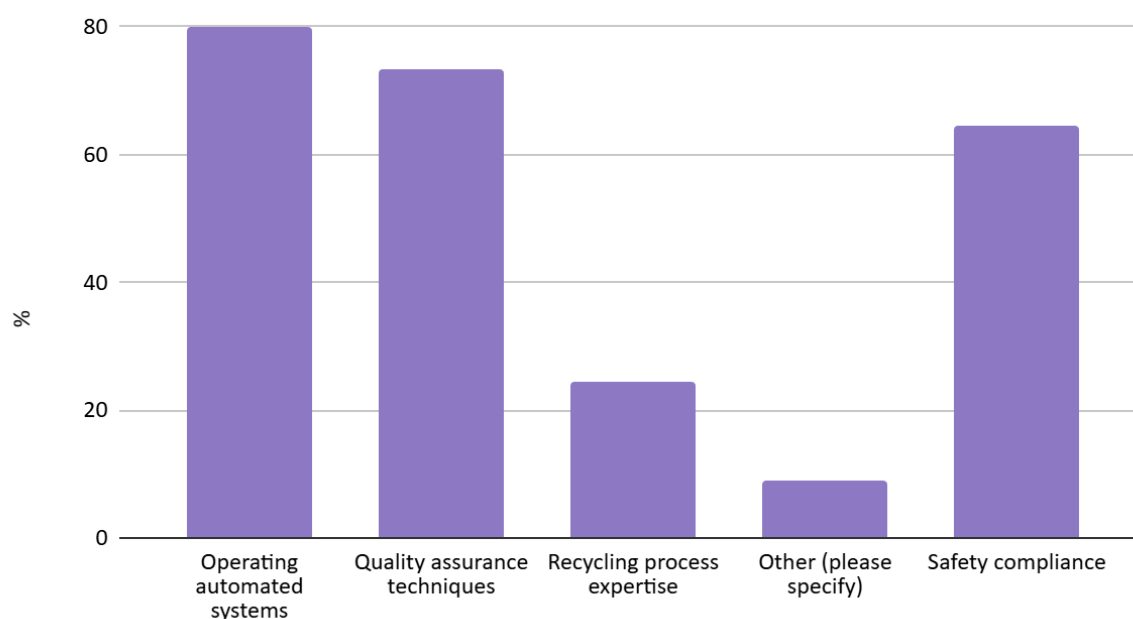


*Figure 17: New specific emerging roles*

## 5. Blue-Collar Workforce

According to the results, the top 3 skills which are required by companies are: Operating automated systems (80%), Quality assurance techniques (73%), and Safety compliance (64%), as illustrated in Figure 18. Recycling skills took around 24% of answers, according to the analysis based on multiple-choice questions.

Top 3 skills you are looking for in blue-collar workers



*Figure 18: Skills ranking in Blue-Collar workforce*

Together with the transformation of the industry in terms of automation and green practices, skills for the workforce are changed and shifted to the need for more technical skills, but also shifted from manual labour to automated processes. 32% of companies recorded focus on compliance and safety as a major skill requirement.

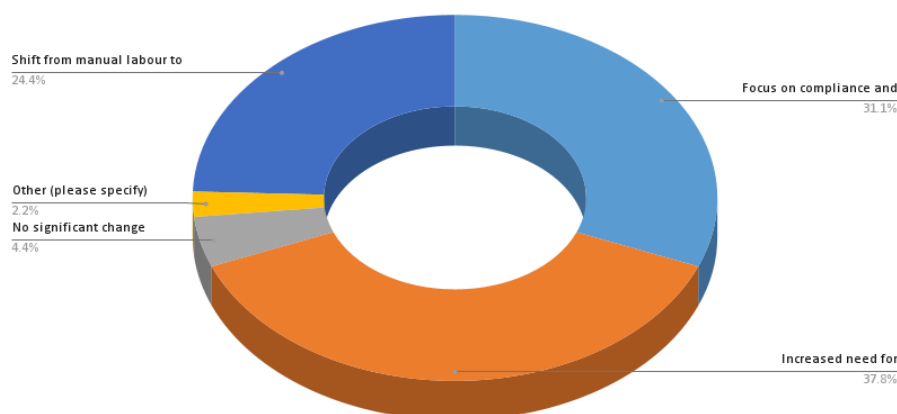


Figure 19: Changes in skill requirements for blue-collar roles reflecting the impact of automation and green practices.

The lifelong learning concept is one of the best approaches to keeping employees up-to-date and to always be on track with innovative products and processes, as well as regulatory compliance in the sector. Almost 80% of the companies offer in-house training for their employees, which is a positive result. Over 60% of the companies have internal workshops and courses organized for employees, and around 10% are outsourcing the educational programs. Around 7% of the companies are not taking care of the training of their employees.

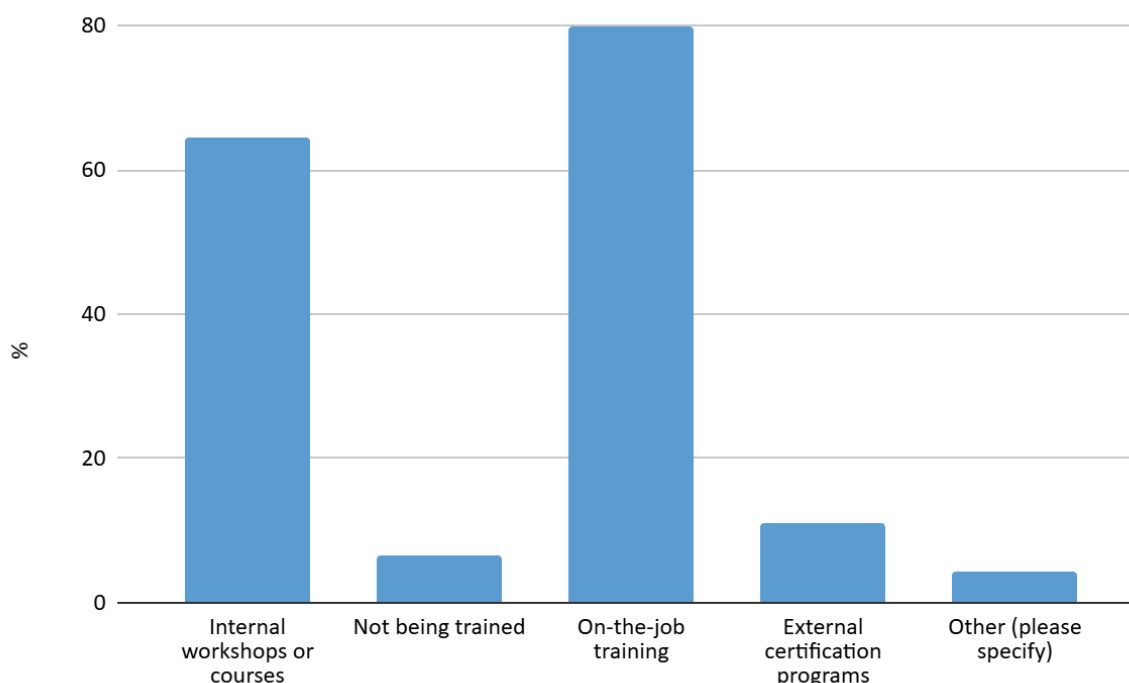


Figure 20: Training programs for blue-collar workers in adopting new technologies

## 6. Academia–Industry Integration & Future Skills

### 6.1 Expanded viewpoint from first iteration survey

Table 1. Summary of objectives from the first and second iteration surveys on education/ courses offered by the plastics sector.

Gaps investigated	First Iteration	Second Iteration (this report)
Training availability and plans	Yes. Investigated companies' plans to implement courses and the targeted topics.	Yes. Investigated the existence of sector-specific skills and knowledge to higher-level education.
Education gaps in plastics sector	Yes. Investigated the awareness of training offered.	Yes. Investigated the education level-job position links.
Generation and gender gaps	Yes. Generation gap is more prevalent than gender gap.	No further investigation is required.
Integration of academia and industry	No.	Yes. Investigated the key actions to integrate sectoral offers and needs, as well as the sufficiency of higher-level education in meeting current job demands.

The second iteration survey aims to explore in greater detail the gaps identified in the first survey, as outlined in Table 1. The first gap examined concerned the types of training currently available or planned by EU companies. Findings revealed that over 50% of surveyed companies had no plans to provide employee training themselves, despite claiming that there is a pressing need for specific skillsets. As a follow-up, the second survey focuses on identifying the specific skills that are lacking in the offered courses (mainly from the academia side) in the plastics sector. The second gap focused on assessing awareness of training programs offered by companies, with many respondents indicating limited or no knowledge of such opportunities. However, this information alone is insufficient without considering the expected education and experience levels required for different job positions, which vary substantially between blue- and white-collar roles. The second survey therefore expands on this aspect to capture these distinctions more accurately. Additionally, the second survey examines the relationship between academia and industry, aiming to strengthen the connection and alignment between sectoral needs and offers. Given the fast-moving pace of research and commercialization in the plastics industry, fostering this synergy is essential to ensure that emerging technologies developed within academia can be effectively implemented and scaled up by the industry.

### 6.2 Mapping the required skillsets—job scope—education level pipeline within the Plastics sector

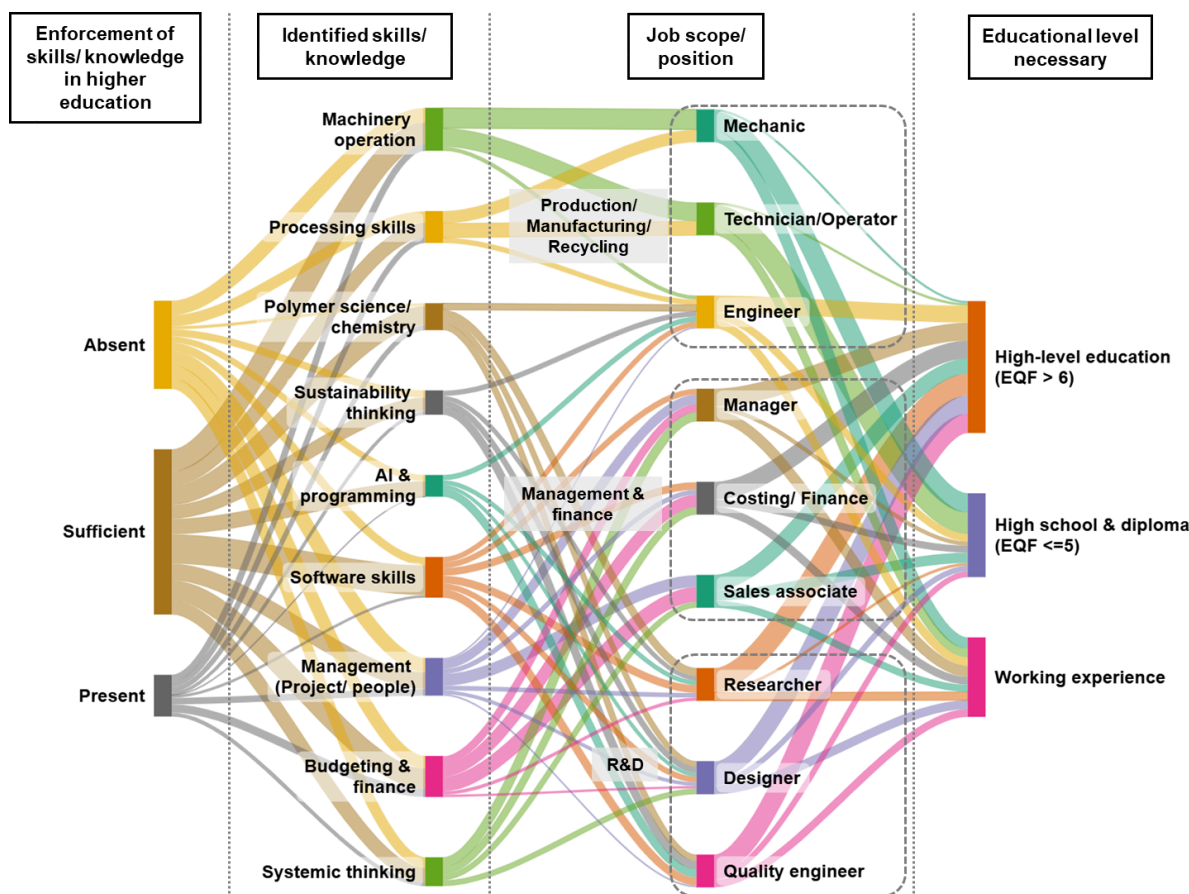


Figure 21: Higher Education Skills and Plastic Industry Roles

Figure 21 shows the results of the second survey in the form of a Sankey diagram, connecting (i) the availability of skillsets in higher education to the common job positions within the plastic sector, and (ii) the job positions to the educational level that is deemed necessary for the respective positions.

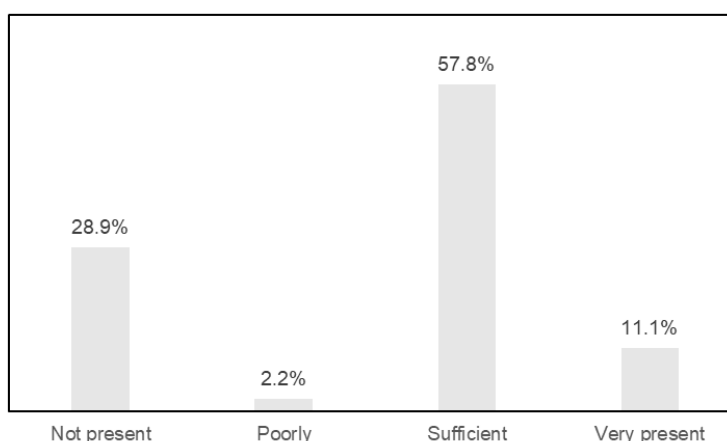
In the second survey iteration, we further explored the relationship between common job roles within the plastics sector, and their corresponding educational requirements. Additionally, the key competencies associated with each role were identified, with the strength of their connections indicating the relative importance of each skill to the job. These competencies can be broadly categorized into five groups: (i) hands-on skills such as machinery operation and processing; (ii) scientific knowledge encompassing polymer science, chemistry, and fluid mechanics; (iii) green skills related to sustainability practices; (iv) digital skills including programming, data analysis, and software proficiency; and (v) soft skills such as management, budgeting, financial literacy, and systems thinking.

Overall (Fig 20.), responses indicate that most positions within the plastics sector still require at least a high-level education. Work experience is relatively evenly distributed across positions but plays a particularly crucial role for technical roles. Only two positions (mechanic and technician/operator) were identified as not requiring an EQF level >5. Their associated competencies, such as machinery operation and processing skills, are often underrepresented in higher education programs, which is expected given the practical,

experience-based nature of these professions. For mechanics, hands-on experience is essential, as their core responsibilities include preventive maintenance, diagnostics, and technical support. Similarly, technicians and operators typically do not require education beyond EQF level 6, as their roles focus on safety procedures and quality control, best acquired through vocational or on-the-job training. Machinery operation is often specific to each plant and process, making it challenging for higher education institutions to address comprehensively within standard curricula. Conveniently, our desk research revealed that most polymer processing courses offered across the EU already include workshops on operating key process units such as compounders, extruders, and dies. To further bridge the gap, this challenge can be addressed by enabling new employees to participate in on-site training under the guidance of experienced workers (apprenticeships) or by attending specialized external workshops.

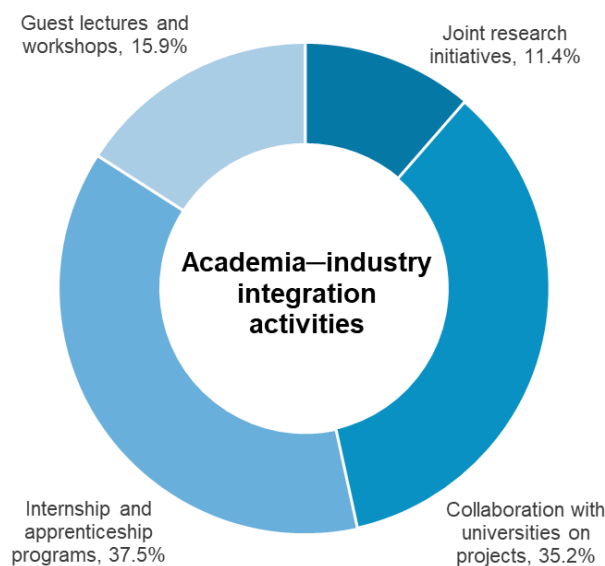
For managerial and finance positions, a high level of education is generally considered essential, though they also require a lot of working experience to gain the necessary soft-skills and understanding of the organisation's structure. These roles demand a combination of top-down level skills and well-developed soft skills, as they involve overseeing organizational operations. Key competencies such as budgeting, financial management, and project/people management are typically present in higher education programs but are often not fully developed, indicating room for further improvement by universities.

Similarly, a high level of education is almost always required for research and development (R&D) roles within the plastics sector. Given the plastic sector's rapid evolution driven by advances in recycling technologies, alternative feedstocks, and processes aimed at meeting new sustainability targets, competencies such as sustainability awareness and systemic thinking (both top-down and bottom-up) have become increasingly vital. Furthermore, as the industry continues to adopt emerging technologies, including improved sorting algorithms, automation, data management systems, and LCA software, it is advantageous for R&D professionals to possess these digital and analytical skills early in the innovation process. Although it is encouraging that some higher education programs already cover these competencies, many respondents still perceive them as insufficiently addressed or entirely lacking.



*Figure 22. shows the responses on whether key technical skills of the plastics sector are addressed in high-level education.*

Based on the mapped skills and their representation in higher education programs, the proportion of responses indicating that these skills are “present” is significantly lower than those indicating they are “absent.” In a related question on the same topic, framed slightly differently (Fig. 22), the responses were also consistent with the trends observed in the Sankey diagram. This raises concern, as it suggests that key competencies required in the plastics sector are either inadequately addressed or that educational institutions are focusing on less relevant skills. While about half of the respondents believe current courses sufficiently cover these areas, further efforts are needed to better prepare future professionals and close the existing skills gap.



*Figure 23. shows the suggestions on improving the integration of academia and industry in terms of digital and green transformation within the plastics sector.*

In the follow-up question, respondents were asked to identify the most effective activities for strengthening academia–industry integration within the plastics sector (Fig 23). The sector is currently experiencing a demographic shift, with a large portion of its workforce nearing retirement age. According to the German Technical Plastics Products Association (TecPart), 88.2% of surveyed German plastics processing companies reported workforce shortages, particularly among plastics technicians and processing mechanics, followed by apprentices and plastics engineers (Gerlach, 2024). Our survey responses similarly emphasized the importance of internships and apprenticeships in providing undergraduates and recent graduates with relevant hands-on experience. Many EU undergraduate programs already require at least one semester of internship, creating a competitive job market that favors graduates with practical experience. To address this challenge, companies should be encouraged to expand internship and apprenticeship opportunities and establish structured training programs to effectively prepare the next generation of professionals.

Furthermore, many respondents agreed that collaborating with universities on industry-based projects can effectively bridge the knowledge gap between academia and practice. Such collaborations may include hosting competitions, organising site visits, conducting real-life production demonstrations, or providing industrial case studies for students. These initiatives

not only enhance practical learning but also help align academic training with the current needs of the plastics industry.

Additionally, other valuable activities include joint research projects and hosting guest lectures or workshops. When universities and industry partners collaborate on shared initiatives (such as the ChemSkills project), it fosters mutual understanding. Academia gains a more practical and application-oriented perspective, while industry is encouraged to innovate. For instance, chemical recycling of plastics is a topic extensively studied in academia but remains underutilized industrially due to cost and technological barriers. Through collaborative projects, industries can identify key bottlenecks that researchers can address, ensuring that innovation translates into practice. Such synergy not only sustains progress but also strengthens the EU's leadership in advanced plastics recycling.

### **6.3 Next steps for Sectoral offers**

With the second survey having identified the key skillsets required in the plastics sector and their current level of representation in higher education, the next step is to examine whether these skills are being addressed by existing academic programs (based on desk research statistics). This analysis will help quantify the gap between industry needs and the training currently offered, providing a clearer picture of where alignment and improvement are most needed.

## 7. References

Gerlach, M. (2024) “LABOUR SHORTAGE EUROPE – Plastics Information Europe,” *Plastics Information Europe*, 23 April. Available at: <https://piweb.plasteurope.com/Default.aspx?pageid=19990&docid=254890> (Accessed: October 24, 2025).