Interreg CENTRAL EUROPE

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GREENE 4.0

D.3.1.2 Selection Report

A.3.1. Screening and selecting GREENE solution seekers

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Contents

A. Executive summary

A.1 Project overview

The GREENE 4.0 project aims at facilitating and supporting small and medium-sized enterprises (SMEs) in the manufacturing sector in the adoption and use of green production methods and digital technologies. Creating a selection report for manufacturing solution seekers is crucial in generating, testing, and piloting smart and green manufacturing value chain models across seven sectoral clusters. It enables the identification of the most appropriate and innovative solutions tailored to each cluster's unique needs, fostering targeted co-creation between manufacturers and solution providers. By offering a structured evaluation of technologies and partners, the report ensures that the solutions deployed align with the goals of the three innovation programs, promoting seamless collaboration. It also enhances the efficiency of the pilot process by pre-selecting high-potential solutions for testing. Ultimately, the report supports the successful scaling of new value chain models by reducing implementation risks and encouraging sustainability-driven innovation.

D3.1.2 – Selection Report works closely with D3.1.1 (Methodology for screening and selecting solution seekers) and will have an impact on D3.1.3 (Sectorial TORs) Terms of References document which will define the requirements and conditions that must be accomplished by solution providers or developers in order to match the needs of each sectorial cluster.

A.2 Scope of the document

This document provides the results of the selection process for companies identified as seeking technological solutions for digital and green transformation within the GREENE 4.0 project, in line with Activity A3.1 in WP3. This report describes the selection process, identified challenges related to both digital and green transformation, as well as other difficulties faced by the companies. Additionally, the document includes a detailed analysis of companies from various regions involved in the project and conclusions that will influence further project actions, including the preparation of "Terms of Reference" (TOR) documents.

A.3 Audience

The audience of this document includes the partners of the GREENE 4.0 project, including all parties involved in the implementation of Work Package 3 (WP3) and Task A3.1. This is an internal document prepared to summarize the results of the company selection process and to prepare for further actions, such as the development of "Terms of Reference" (TOR). The document may also be used by the lead partner (LP) and supporting institutions to monitor progress and implement any necessary adjustments.

A.4 Change control

KPT/PP8 created this document, and it is subject to the standard project change control where PPs are requested to provide feedback on the stated definition or tools in writing to the deliverable responsible (in this case KPT/PP8) in a timely manner (within 8 working days after each edition).

B. Introduction

B.1 Project overall flow

The Central European manufacturing industry is facing significant disruptions. Global supply chains are increasingly unstable, and the green transition demands the development of more sustainable and smarter value chains. The GREENE 4.0 project aims to assist manufacturing companies in piloting innovative value chains. It also encourages the co-creation of new products and services through open innovation methods. To achieve this, the project connects businesses with educational institutions, research organizations, and policymakers.

GREENE 4.0 is divided into four work packages, each with a distinct goal:

WP1 focuses on identifying the needs and challenges of SMEs in adopting green technologies and mapping available enablers across different CE regions. The findings will inform the development of the UAM (Universal Adoption Model), which will guide companies in implementing new technologies and link them to tools identified in WP2.

WP2 works on creating solutions to address the identified challenges and connect them with existing innovations. The aim is to build a robust innovation ecosystem to help SMEs adopt sustainable practices. WP2 will also lay the foundation for the Transnational Open Knowledge Box, a repository of tools supporting innovation and capacity building.

WP3 consolidates data from WP1 and WP2 to develop three innovation programs that will test the Transnational Open Knowledge Box. The programs will ensure the results are transferable and will link seven sector-specific manufacturing clusters with solution providers to co-create sustainable supply chain models.

WP4 emphasizes policy learning and enhances the transferability of the project outcomes through a quadruple helix approach, engaging SMEs, solution providers (businesses and research organizations), and policymakers.

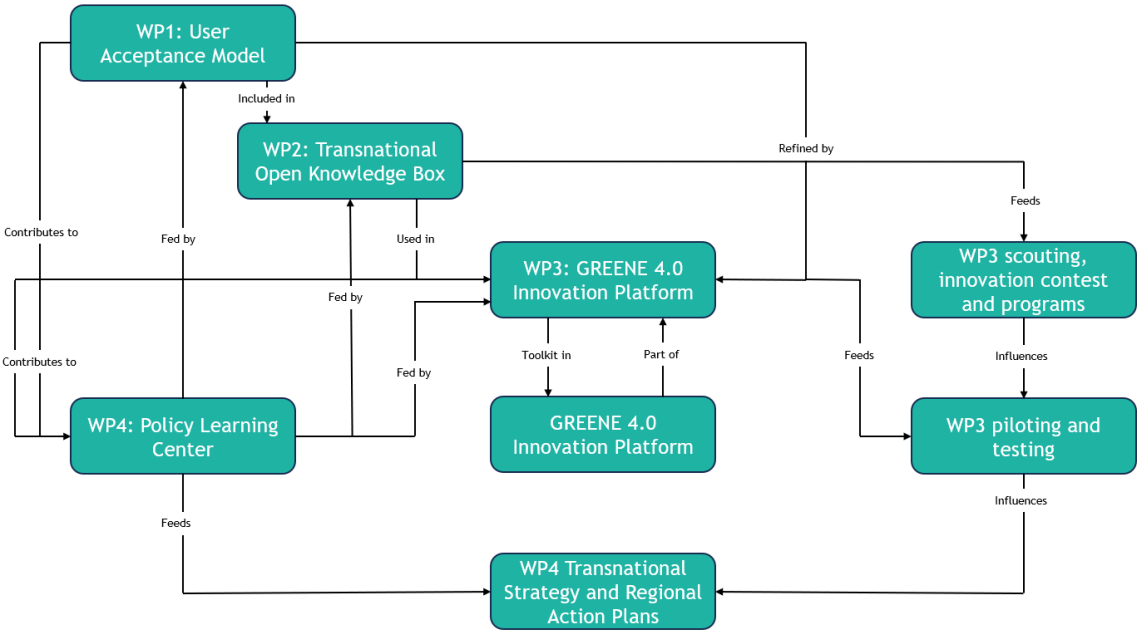


Figure 1: The project flow and the synergies and linkages between the WPs and their deliverables are shown in

B.2 Activity 3.1 and its place in WP3

Activity 3.1 (A3.1) within Work Package 3 (WP3) focuses on the identification and selection of companies seeking support in digital and green transformation, in line with the objectives of the GREENE 4.0 project. It is the first key phase of WP3, aimed at selecting companies in seven regions involved in the project. Under A3.1, project partners were tasked with identifying companies from various industrial sectors with specific needs for the development of innovative solutions in the context of digital and green transformation.

Each partner was required to identify at least 10 companies in their region, evaluating them based on defined criteria, such as company size, industry sector, readiness to implement innovations, and technological needs. These companies were then assigned to seven sectoral clusters, enabling further collaboration with technology providers within WP3. A3.1 forms the foundation upon which the subsequent stages of WP3, such as creating innovation programs (A3.3) and piloting new solutions (A3.4), are built.

C. Methodology

Process description

The company selection process under Activity A3.1 was developed in accordance with the methodology described in document D3.1.1, "Methodology for Selecting Manufacturing Technology Seekers." The aim of these actions was to identify and select industrial companies with clearly defined needs in terms of digital and green transformation, in line with the objectives of the GREENE 4.0 project.

The selection process began with a "screening" phase, during which the project partners (PPs) searched for potential companies in their regions. Each partner was required to identify at least 20 companies based on predefined criteria. During this phase, partners used various methods, including market research, personal contacts, and regional innovation workshops where companies could express their needs.

After completing the screening phase, partners conducted the evaluation and pre-selection process based on criteria such as:

- company size (SME or large enterprise),
- industry sector (chemical, energy, manufacturing, etc.),
- technological readiness level (TRL),
- needs related to digital and green transformation.

Each company that passed the pre-selection process was recorded on a company card, which contained key information about the company, its technological and green needs, and its ability to implement innovations. Project partners from each region were tasked with preparing 10 company cards (a total of 70 companies for the entire project).

Based on the company cards provided, the coordinating partner (PP8) prepared a draft selection report summarizing the results for all regions. These companies will be assigned to seven sectoral clusters,

enabling further actions, such as the development of the "Terms of Reference" (TOR) document, which will be used to match solution-seeking companies with appropriate technology providers.

The stages of the screening and selection process are shown in Figure 2.

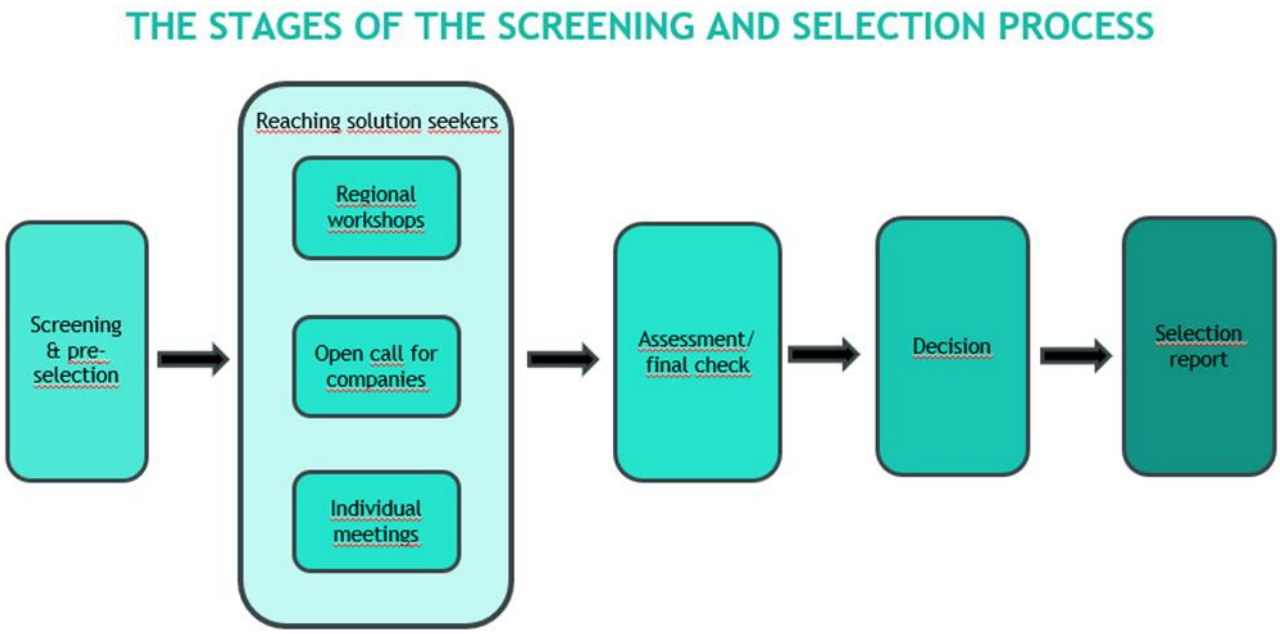


Figure 2: The stages of the screening and selectin process (Source: Author Generated, 2024)

D.Analysis per country

This section provides a summary of the key insights gathered from the regional screening and selection process. It highlights the methods employed to engage solution seekers, presents a list of identified companies, including their sector and operational status, and concludes with a categorized overview of the identified needs and challenges, grouped into green and digital clusters.

D.1 Slovenia analysis – key findings

D1.1 Used methods

PTP team with support of UL implemented a comprehensive strategy targeting SMEs across seven sectors. The approach began with a detailed search and survey process to identify potential solution seekers who could benefit from the initiative.

The outreach efforts included a multi-channel approach: more than 400 targeted emails were sent, followed by direct phone calls to engage companies and discuss collaboration opportunities. Social media campaigns were also utilized. Additionally, industry event presentations, newsletters, and word-of-mouth recommendations further broadened the reach.

Engagement with potential solution seekers typically involved multiple steps. After the initial outreach, phone calls helped establish personal connections, leading to 2-3 meetings with each SME to better understand their needs. While most sessions were held online, in-person meetings often resulted in more productive discussions and deeper engagement.

Through this process, 10 companies were selected by PTP as those most aligned with the project's goals and likely to benefit from the support provided. The combination of diverse outreach methods and personalized follow-ups ensured both broad reach and a focus on the most promising solution seekers.

D1.2 Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
N&N d.o.o.	SME	Building materials and furntiure
Bio dan d.o.o.	SME	Food and Beverage
ELVEZ d.o.o.	SME	Machinery and equipment
Aluvar d.o.o.	SME	Metal
Linox d.o.o.	SME	Metal
DUKIN d.o.o.	SME	Metal
Mb-95 podjetje za inženiring in trgovanje na debelo in drobno Krog d.o.o.	SME	Metal
Formateh d.o.o.	SME	Metal
Miniplast d.o.o.	SME	Plastics and rubber
CAP d.o.o.	SME	Plastics and rubber

Table 1: Identified companies from Slovenia

All companies belong to the group of small and medium-sized enterprises. Half of them (5) represent the metal sector; other sectors include plastics and rubber (2), building materials and furniture (1), food and beverage (1), machinery and equipment (1)

D1.3 Identified challenges

The following list includes green and digital challenges identified by solution seekers:

Digital challenges	Green challenges
• upgrading Excel sheet system • integrating AR/VR technologies • digitalizing quality control • preparing digital passport documentation for each product • integrating AI • integrating ERP system • integration of data from machinery • calculation of material, energy, time requirements • remote production control • integrating Manufacturing Execution System • providing customers with data about products in	• tracking raw materials • monitoring of energy consumption

stock • production planning • optimizing logistics • access to full information on resources, costs and production progress • error detection and correction system	

Table 2: Identified challenges for Slovenian companies

D.2 Germany analysis – key findings

D2.1 Used methods

TGZ Bautzen contacted companies in its region through several different channels. These included a workshop held during a TEAM22 machine engineering and metalworking network meeting (six potential companies), personalized e-mails with follow-up phone calls (reaching thirty companies), and an industry association (VEMASinnovativ). Additionally, outreach was done via the in-house magazine "TGZ-Aktuell" (print and digital, reaching approximately 1,200 recipients, with around 100 companies fitting the B2GreenHub criteria) and the TGZ website, which was primarily used to direct companies to learn more about GREENE 4.0 and B2GreenHub. The associated partner, Mittelstand-Digital Zentrum Spreeland, also posted the call on their website, while LinkedIn was used for select social media outreach.

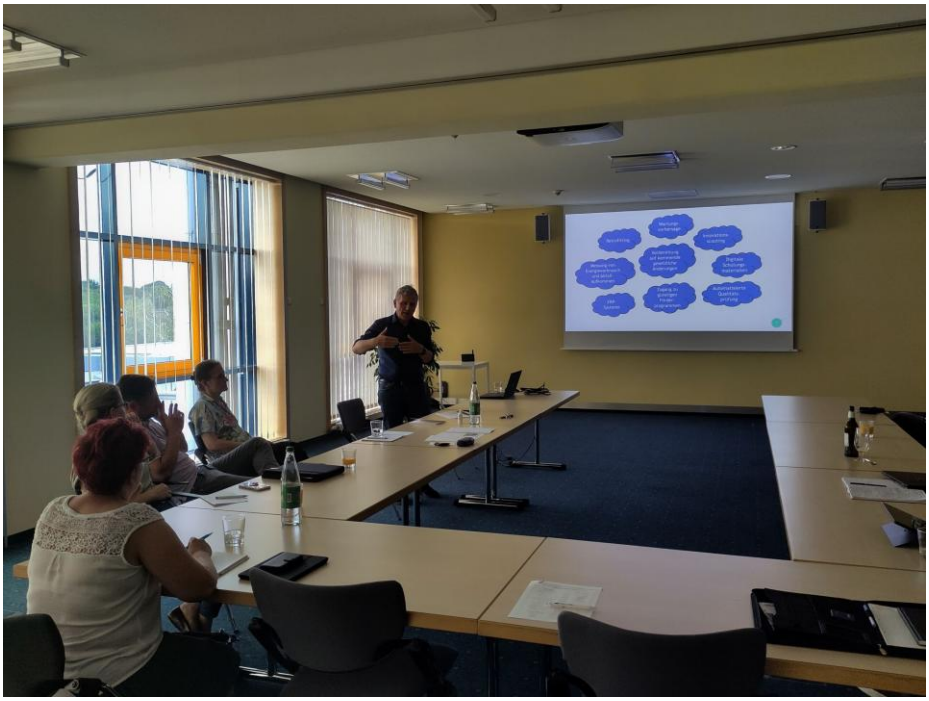


Photo 1. Open Innovation workshop held by TGZ Bauzen

Companies were chosen based on prior interactions with GREENE 4.0 (through surveys or user acceptance interviews), existing ties with TGZ Bautzen (e.g., tenants, TEAM22 members, or other project collaborations), or through recommendations. The "TGZ-Aktuell" subscriber base was not specifically filtered to target solution seekers. The workshop, held at TGZ Bautzen's conference center,

attracted six potential companies, which was below average attendance, likely due to the summer vacation period coinciding with school holidays in Saxony.

D2.2 Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
tucore GmbH	SME	Electronics
Lorenz Bahlsen Snack-World GmbH & Co KG Germany	SME	Food and Beverage
IDEEMA GmbH	SME	Machinery and equipment
PURTEC Engineering GmbH	SME	Machinery and equipment
ATN Hölzel GmbH	SME	Machinery and equipment
RELO GmbH	SME	Machinery and equipment
SIMU-Fertigungs GmbH	SME	Metal
FWH Federnfabrik Wilhelm Hesse GmbH	SME	Metal
ARNELL | Arno Hentschel GmbH	SME	Metal
ARNIO GmbH	SME	Metal

Table 3: Identified companies from Germany

All companies belong to the group of small and medium-sized enterprises. 4 of them represent machinery and equipment sector, also 4 companies are in the metal industry. Other sectors include: electronics (1) and food and beverage (1).

D2.3 Identified challenges

The following list includes green and digital challenges identified by solution seekers:

Digital challenges	Green challenges
• integrating Excel files and ERP system • digital learning for employees • computer-aided production control and monitoring • tracking and delivery efficiency	• integrating sustianable practices in logistic operations • optimization of energy consumption • material efficiency • verifying the origin of raw materials • reporting and compensating carbon footprint

Table 4: Identified challenges for German companies

D.3 Austria analysis – key findings

D3.1 Used methods

FH Kufstein Tirol - University of Applied Sciences implemented a multifaceted approach to identify and engage potential companies in Austria, utilizing various channels to maximize outreach.

Two targeted workshops were organized, bringing together key stakeholders such as banks, business authorities, regional manufacturers, and other relevant organizations. These workshops facilitated discussions on market needs, partner opportunities, and direct engagement with companies aligned with the project's objectives. The first workshop took place on May 23, with representatives from the Kitzbühel Innovation Network and the Tyrolean Chamber of Commerce in attendance. During the workshop, numerous discussions were held, emphasizing the necessity of integrating digital and sustainable practices for future success. The second workshop took place on July 16 – this workshop focused on creating smart strategies for sustainable futures, attracting businesses from Kitzbühel, Kufstein, and Bavaria.

Photo 2: Open innovation workshop held by FH Kufstein Tirol - University of Applied Sciences

Newsletters (FH Kufstein Tirol, Tyrolean Chamber of Commerce, clusters from Tyrolean location agency) were also used to promote GREENE 4.0 and B2GreenHub, raising awareness and attracting interest from companies that might not have been otherwise informed.

In addition, FHK tapped into its student network during the annual career fair to engage family-run businesses, as many students are closely connected to such companies, providing a unique outreach channel.

D3.2 Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
Bachmann Schlafsysteme GmbH	SME	Building materials and furntiure
Haslinger Spielplatz	SME	Building materials and furntiure
FRITZ EGGER GmbH & Co. OG	Large	Building materials and furntiure
Freisinger Fensterbau GmbH	SME	Building materials and furntiure
Vöcklakäserei eGen	SME	Food and Beverage
Grissemann Maschinenbau GmbH	SME	Machinery and equipment
enrope GmbH	SME	Machinery and equipment
Zimmer Austria GmbH	SME	Machinery and Equipment
Heliotherm	Large	Metal
Faissner Petermeier Fahrzeugtechnik AG	SME	Metal

Table 5: Identified companies from Austria

8 companies belong to the group of small and medium-sized enterprises; 2 companies were classified as large. Represented sectors include: building materials and furniture (4), machinery and equipment (3), metal (2) and food and beverage (1).

D3.3 Identified challenges

The following list includes green, digital and other challenges identified by solution seekers

Digital challenges	Green challenges	Other
• Optimizing document management • Analyzing large amounts of data from production in real-time to optimize processes • Implementing predictive maintenance to minimize downtimes and extend the service life of machines • Integrating AI in production planning and control for flexible and efficient production • Simplified digital production planning tools	• Sustainable energy production • Optimization of heating energy system • Using raw materials and increasing recycling efforts • Conducting ecological footprint analysis	• Keeping up with legal and social requirements • Facilitating exchange of knowledge between science and practice • Lack of experience in sales, brand building, and marketing

• Audiovisual training programs on digitalization and sustainability for employees • Addressing non-standardized resource management systems and fragmented communication with authorities by integrating automated solutions • Implementing VR technologies • Fully digitizing production processes and integrating automation technologies to increase efficiency		

Table 6: Identified challenges for Austrian companies

D.4 Czech Republic analysis – key findings

D4.1 Used methods

ICUK with support of UJEP identified and selected solution seekers through direct, personal meetings, which facilitated in-depth discussions to understand each company's needs and how they aligned with the objectives of GREENE 4.0. By organizing one-on-one meetings, ICUK was able to have tailored conversations that addressed specific challenges and highlighted the benefits of participating in the project. These meetings were instrumental in building trust and providing detailed explanations of how GREENE 4.0 could support the companies' goals.

In addition, ICUK leveraged its existing business networks to identify and reach out to companies most likely to benefit from the project. This approach allowed ICUK to engage with companies that already had a baseline understanding of the project's value, making the interaction process more efficient.

As a result of these targeted efforts,ICUK engaged 20 companies and ultimately selected 10 that demonstrated the strongest alignment with the project's objectives. This selective approach ensured that the chosen companies were well-positioned to benefit from and contribute to the goals of GREENE 4.0.

D4.2 Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
DAMA net	SME	Building materials and furniture
Kermen Lobri	SME	Building materials and furniture
Zichovecká	SME	Food and Beverage
Dorant	SME	Food and Beverage
Rowingo	SME	Machinery and equipment

KOVO Děčín spol. s r.o.	SME	Metal
Latislav	SME	Other
Jabor pro, s.r.o.	SME	Plastics and rubber
Posedla s.r.o.	SME	Plastics and rubber
Virgin Grip	SME	Plastics and rubber

Table 7: Identified companies from Czech Republic

All companies belong to the group of small and medium-sized enterprises. There is no dominating sector among solution-seekers from Czech Republic – there are 3 companies from plastics and rubber sector, 2 from building materials and furniture sector, also 2 represent food and beverage. Remaining sectors include metal (1) and machinery and equipment (1). One company does not operate in any of the 7 highlighted sectors.

D4.3 Identified challenges

The following list includes green, digital and other challenges identified by solution seekers:

Digital challenges	Green challenges	Other
• Integrating data analytics • Integrating IoT • Integrating machine learning • Implementing robotics and automated system • Optimizing production process	• reducing energy consumption • reducing carbon footprint • integrating sustainable and recycled materials	• efficient project management • expanding market reach in residential and commercial sectors • scaling production while maintaining quality • expanding distribution • intellectual property protection and patent processes

Table 8: Identified challenges for Czech companies

D.5 Italy analysis – key findings

D5.1 Used methods

INTELLIMECH employed various channels to identify and engage potential solution seekers. One key approach was leveraging its regular event, “Pomeriggio Intellimech,” where industrial players—both SMEs and large enterprises—are invited to discuss upcoming innovation activities and challenges. During the session focused on "Advanced Materials," IMECH highlighted both the green and digital aspects embedded in advanced materials, such as sustainability challenges, recyclable materials, digital tools to enhance material properties, and the application of sensors. Additionally, IMECH introduced the GREENE 4.0 project as an opportunity for participants to engage further in innovation efforts.

This event enabled IMECH to preliminarily identify 20 companies in the Lombardy region as potential solution seekers. Following this, IMECH narrowed the list to 10 of the most promising and interested companies by leveraging one-on-one interviews conducted in recent months. As a research consortium serving its industrial associates, IMECH maintains regular contact with companies to understand their

specific needs and challenges, which helps pinpoint potential innovation areas for both individual and collaborative projects.

Additionally, IMECH conducted a series of interviews and organized meetings as part of WP1 and WP2 of the GREENE 4.0 project. These interactions provided another valuable channel for gathering information, as companies expressed their interest in participating in project activities, further enriching the pool of potential solution seekers.

D5.2 Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
SALF SPA	SME	Pharmaceutical & Chemical
SANGALLI SPA	SME	Building materials and furntiure
Vinservice Micro Matic S.r.l.	Large	Food and Beverage
BALANCE SYSTEMS SRL	SME	Machinery and equipment
COSBERG SPA	SME	Machinery and equipment
RULLI RULMECA	Large	Machinery and equipment
SCAMM SRL	SME	Machinery and equipment
TESMEC SPA	Large	Machinery and equipment
GENESI SRL	Large	Metal
GUALINI LAMIERE INTERNATIONAL SPA	SME	Metal

Table 9: Identified companies from Italy

Dominating sector is machinery and equipment (5 companies); other sectors include metal (2 companies), pharmaceutical and chemical (1), building materials and furniture (1), food and beverage (1).

D5.3 Identified challenges

The following list includes green and digital challenges identified by solution seekers:

Digital challenges	**Green challenges**
• automation of manufacturing process to increase productivity and reduce human errors • VR/AR for training purposes and product management • Data collection and analysis for the optimization of production lines • Implementation of digital technologies for supporting employees in maintenance activities and offering maintenance on-demand services	• Increasing the use of sustainable materials • Reducing waste materials and components during manufacturing • Development of technologies and processes for the reuse, remanufacturing, and recycling of products, components, and materials, with current limitations in the machinery sector • Reducing the environmental impact of

• AI and digital technologies for the company's knowledge management • Generative AI for data analytics to increase customer satisfaction based on market trends • Hierarchical models for production line analysis to be applied to products • Automatic knowledge system to preserve company competences and experiences	products by introducing waste and emissions reduction technologies, enhancing recycling, energy saving, and consumption optimization

Table 10: Identified challenges for Italian companies

D.6 Poland analysis – key findings

D6.1 Used methods

The KTP team focused on organizing workshops for representatives of manufacturing companies. The process began with identifying the right companies within the KTP ecosystem, considering factors such as previous collaboration within the project, sector affiliation, willingness to share challenges, and openness to innovation. The recruitment process involved sending emails and making phone calls. Assistance from other departments focusing on innovation, pilot programs, and startup acceleration was also utilized, allowing them to reach a broader group of companies that met the criteria.

Photo 3: Open innovation workshop held by Krakow Technology Park

The workshops took place on March 22 at the institution's headquarters, with 16 participants representing 10 companies from the region, including businesses from the metal, chemical, and construction industries. During the workshops, the companies were guided through a multi-step process to identify key challenges, both digital and green. First, they were asked to point out sources of business inspiration, then to identify their problems and reformulate them into challenges that contained a call to action. The next task was for the companies to select the most critical challenges. The final stage introduced them to sources of information about solution providers (databases of startups and young

tech companies) that could potentially address the identified challenges. The companies were also invited to a second workshop, where they would meet with startup representatives.

The workshop format facilitated the process of defining challenges and encouraged greater openness from the companies.

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
Grupa Azoty	Large	Pharmaceutical & Chemical
Elektrotermia	SME	Building materials and furntiure
FAKRO	Large	Building materials and furntiure
Vitroform	SME	Building materials and furntiure
Marian Dudzik Lody	SME	Food and Beverage
Woodward	Large	Machinery and equipment
Arkan	SME	Metal
Lavaster	SME	Metal
Protech	Large	Metal
Werner Kenkel	Large	Other

Table 11: Identified companies from Poland

3 identified companies were classified as large, remaining 7 are SMEs.

Two most popular sectors are Building materials and furniture and metal (3 companies per each). Other represented sectors are pharmaceutical and chemical (1), food and beverage (1), machinery and equipment

D6.2 Identified challenges

The following list includes green, digital and other challenges identified by solution seekers

Digital challenges	Green challenges	Other challenges
• digitalisation of documents • quantifying production output with CNC machines • effective management of post-production waste, planning and optimization of logistics • digitizing processes	• Compliance with ESG regulations • Reducing energy consumption • Implementing renewable energy • Minimizing waste production • Improving recycling process • Shifting to electric cars • Contaminated water and poor sewage systems • Calculating and reducing carbon	• Limited access to financial resources • scaling production while maintaining quality • increasing employee awareness of waste segregation and occupational safety. • employee training solutions that promote the careful and efficient use of materials,

	footprint • Water circulation monitoring • innovative solutions in the field of ecological packaging of pallets without the use of stretch foil and automation of waste records in the BDO system • installing solar panels, • optimizing energy efficiency • methods of calculating and reducing the carbon footprint through product life cycle analysis. • reducing the consumption of production materials • ESG reporting tools • solutions enabling the reuse of wood and paper waste in production processes	minimizing consumption and waste generation.

Table 12: Identified challenges for Polish companies

D.7 Hungary analysis – key findings

D7.1 Used methods

MGFU approach to identifying and selecting solution seekers was thorough and strategic, utilizing a combination of direct engagement and established networks. The team reached out to both well-established companies and newly identified ones, ensuring a broad and diverse range of participants.

The selection process began with in-person meetings and phone interviews. In-person meetings facilitated deeper engagement, allowing the team to gain a more comprehensive understanding of each company's specific needs and challenges. For those unable to meet face-to-face, phone interviews were conducted to maintain flexibility while still capturing all the necessary information.

In addition, the MGFU team leveraged its extensive network of business contacts to identify companies already familiar with digital transformation and sustainability initiatives, as well as newer companies eager to explore innovative solutions. This blended approach allowed them to engage companies with varying levels of readiness for change, ensuring a diverse and representative group of solution seekers.

The selection criteria targeted companies across a range of industries, including manufacturing, food production, and chemicals, resulting in a diverse group of participants with diverse challenges and opportunities.

Identified companies

The following list includes the companies identified by the partner along with the size and sector of operation:

Company's name	Size	Sector
Gellei Hajvilág Ltd.	SME	Pharmaceutical & Chemical
Urban Dandy Ltd.	SME	Pharmaceutical & Chemical
Galaxy Distribution Ltd.	SME	Pharmaceutical & Chemical
KKVJ Cement Ltd.	SME	Building materials and furntiure
DTG Cement Ltd.	SME	Building materials and furntiure
Wicha Teszta	SME	Food and Beverage
Seamaster Products Ltd.	SME	Food and Beverage
Naturtex Ltd.	SME	Other
PolymerOn Ltd.	SME	Plastics and rubber
UgrinPack-Erdősi Kft.	SME	Plastics and rubber

Table 13: Identified companies from Hungary

All companies belong to the group of small and medium-sized enterprises. There is no dominating sector among solution-seekers from Hungary – there are 3 companies from pharmaceutical & chemical, 2 from building materials and furniture sector; food and beverage and plastics and rubber sectors are also represented by 2 companies each. One company does not operate in any of the 7 highlighted sectors.

D7.2 Identified challenges

The following list includes green and digital challenges identified by solution seekers

Digital challenges	**Green challenges**	**Other challenges**
• Enhancing online sales channels • Enhancing digital infrastructure for better tracking and delivery efficiency • Improving inventory management and reducing packaging costs • Ensuring continuous staff training • Maintaining production efficiency while scaling operations • AI integration to enhance process optimization	• Integrating sustainable practices within logistics operations • Modernizing facilities to comply with environmental regulations • Optimizing resource usage to align with renewable energy availability • Integrating green energy and waste reduction practices • Improving supply chain management and expanding green packaging solutions	• Lack of grants • Securing new loans and grants to further improve the green transition

Table 14: Identified challenges for Hungarian companies

E. Summary

Based on the information delivered by 70 manufacturing companes from 7 Central European countries within activity A.3.1. the document ensures that companies are really interested in the topic of green and digital transition. The companies highlight the complexities of these transitions, but also point to significant opportunities for them that can effectively navigate these challenges. By understanding these insights and their implications, Greene 4.0 partners can develop more effective strategies for their digital and green initiatives. Our key findings are similar to the User Acceptance Model testing report that are:

- **Varied Maturity Levels Across Sectors.** Companies in electronics, software, and machinery scored high in digital maturity but lagged in green practices. Traditional sectors like metal products and food & beverages scored lower overall. Regardless of the sector, there's room for improvement. Less digitized sectors can gain an edge through digital transformation, while advanced sectors must keep pushing innovation.
- **Challenges for Small SMEs**. Smaller SMEs often feel disadvantaged in adopting new technologies due to limited financial and human resources. However, some small companies (10-49 employees) achieved high digital maturity, even outperforming larger firms, proving size isn't always a barrier.
- **Digital and Green Synergies**; There is a strong correlation between digital and green maturity. Companies scoring high in digital were also more likely to excel in green practices. This suggests that digital and green transitions are mutually reinforcing, and companies should seek opportunities where digital tools drive sustainability, and vice versa.
- **Skills and Expertise Gap**. A major barrier to digital and green transitions is the lack of skilled employees, especially in traditional manufacturing sectors. Even well-funded companies struggle without the right technical and sustainability expertise, slowing their transformation efforts.
- **Measurable Goals and Continuous Improvement**. Companies that set clear, measurable goals for their digital and green initiatives, and regularly monitored KPIs, showed greater progress. Data-driven approaches to track energy efficiency, waste reduction, and process optimization help SMEs prioritize efforts, justify investments, and demonstrate results to stakeholders.

E.1 Sectorial clusters

The challenges identified by the surveyed companies have been categorized into seven sectoral clusters, reflecting the key areas of focus for green and digital transformation. This structured approach helps uncover patterns and generalizations, enabling the B2GreenHub platform to better address the specific needs of individual users. The clusters, divided into green and digital categories, showcase the diverse challenges faced by companies in transitioning towards more sustainable and digitally advanced practices. These findings lay the foundation for targeted solutions that drive both innovation and sustainability.

1. **Green sectorial clusters:**
    a. Green & sustainable materials:
        i. increasing the use of sustainable materials (Italy)
        ii. integrating sustainable and recycled materials (Austria)

b. Waste reduction & recycling technologies:
   i. effective management of post-production waste (Poland)
   ii. development of technologies and processes for the reuse, remanufacturing, and recycling of products, components, and materials (Italy)
   iii. solutions enabling the reuse of wood and paper waste in production processes (Poland)

c. Energy efficient technologies:
   i. optimization of energy consumption (Germany, Italy)
   ii. optimizing energy efficiency (Poland)
   iii. optimizing heating energy systems (Italy)

d. Renewable energy technologies:
   i. implementing renewable energy (Poland)
   ii. integrating green energy and waste reduction practices (Hungary)
   iii. sustainable energy production (Italy)

2. Digital clusters:

a. Data analytics & artificial intelligence:
   i. integrating AI (Slovenia, Italy)
   ii. data collection and analysis for the optimization of production lines (Italy)
   iii. generative AI for data analytics to increase customer satisfaction based on market trends (Italy)

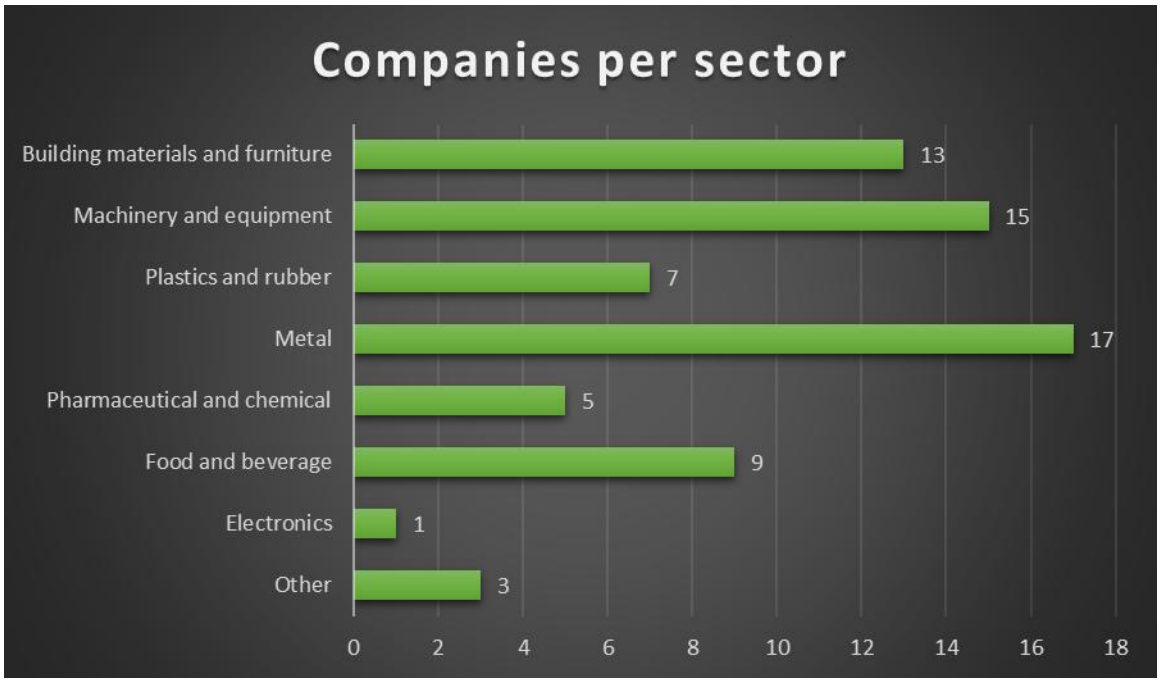
b. Automation & robotics:
   i. automation of manufacturing processes to increase productivity and reduce human errors (Italy)
   ii. implementing robotics and automated systems (Austria)
   iii. fully digitizing production processes and integrating automation technologies (Austria)

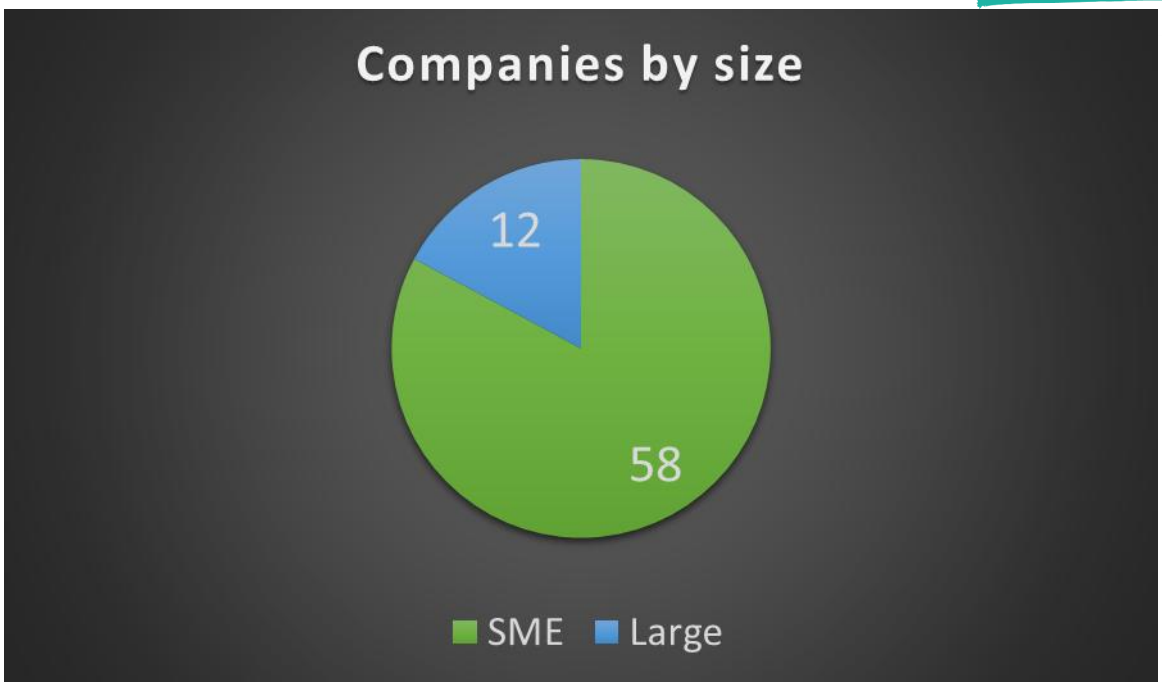
c. Digitalisation & connectivity:
   i. upgrading Excel-based systems (Slovenia)
   ii. integrating AR/VR technologies (Slovenia)
   iii. digitalizing quality control (Slovenia)
   iv. digital passport documentation for products (Slovenia)
   v. integrating ERP systems (Slovenia)
   vi. integration of data from machinery (Slovenia)
   vii. remote production control (Slovenia)
   viii. integrating Manufacturing Execution Systems (Slovenia)
   ix. digital learning for employees (Germany)
   x. computer-aided production control and monitoring (Germany)
   xi. optimizing document management (Austria)
   xii. integrating data analytics, IoT, and machine learning (Austria)
   xiii. AI and digital technologies for the company's knowledge management (Italy)
   xiv. hierarchical models for production line analysis (Italy)
   xv. automatic knowledge systems to preserve company competences (Italy)
   xvi. digitalisation of documents (Poland)
   xvii. enhancing digital infrastructure for better tracking and delivery efficiency (Hungary)

The analysis of challenges highlights the varying degrees of readiness and focus across different sectors. Green clusters emphasize waste reduction, energy efficiency, and the integration of renewable energy, while digital clusters focus on enhancing connectivity, automation, and data analytics. Particularly significant are the extensive needs identified in the area of digitalisation and connectivity (Digitalisation & Connectivity cluster), ranging from upgrading outdated systems to integrating advanced solutions such as AR/VR, ERP systems, and real-time production control. This underscores the critical role digital transformation plays in improving operational efficiency and supporting green initiatives. The findings reveal strong synergies between digital and green transformations, suggesting that advancements in one area often support progress in the other.

E.2 Aggregate statistics

Below are the aggregate statistics reflecting the size of each sector and the ratio of small and medium-sized enterprises to large companies.





As can be observed, the most represented sectors are metal (17 companies), machinery and equipment (15 companies), and building materials and furniture (13 companies). On the opposite end, the chemical and pharmaceutical sectors have 5 companies, while the electronics sector is represented by only one company. The notably low representation of the electronics sector is particularly striking – it can be assumed that companies operating in this high-entry-barrier industry are quicker to adopt innovative solutions, especially digital ones, and thus currently have fewer needs in this regard. The nature of their business forces them to adapt to the latest trends. The most represented sectors are traditionally energy-intensive and resource-consuming. Three companies that do not belong to any of the listed sectors represent the packaging, publishing, and textile industries.

E.3 Next steps

In the next stage of the project, partner PP3 will be responsible for developing the "Terms of Reference" (TOR) for each sectoral group. The TORs will specify the detailed requirements that technology solution providers must meet to address the needs of the companies selected under A3.1. This document will be used to match solution-seeking companies with appropriate technology providers.

The next step will be to organize an online conference where all project partners will be able to review the developed TORs and provide any feedback or suggestions. After the consultation, PP3, together with PP2, PP7, and PP9, will finalize the TOR documents, which will be used to implement the next stages of the project, including pilot innovation programs under WP3. The Innovation Program will then be launched, inviting all solution seekers to participate and identify solutions that address their specific problems and needs.

F. Appendix

- Company cards