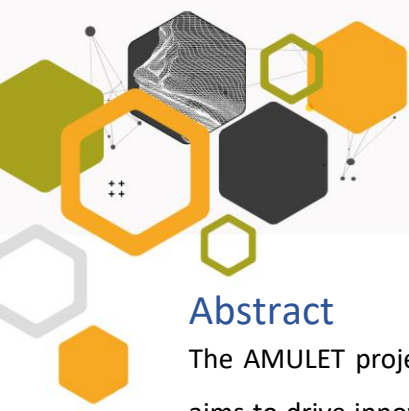


<p>Final policy recommendations</p>	
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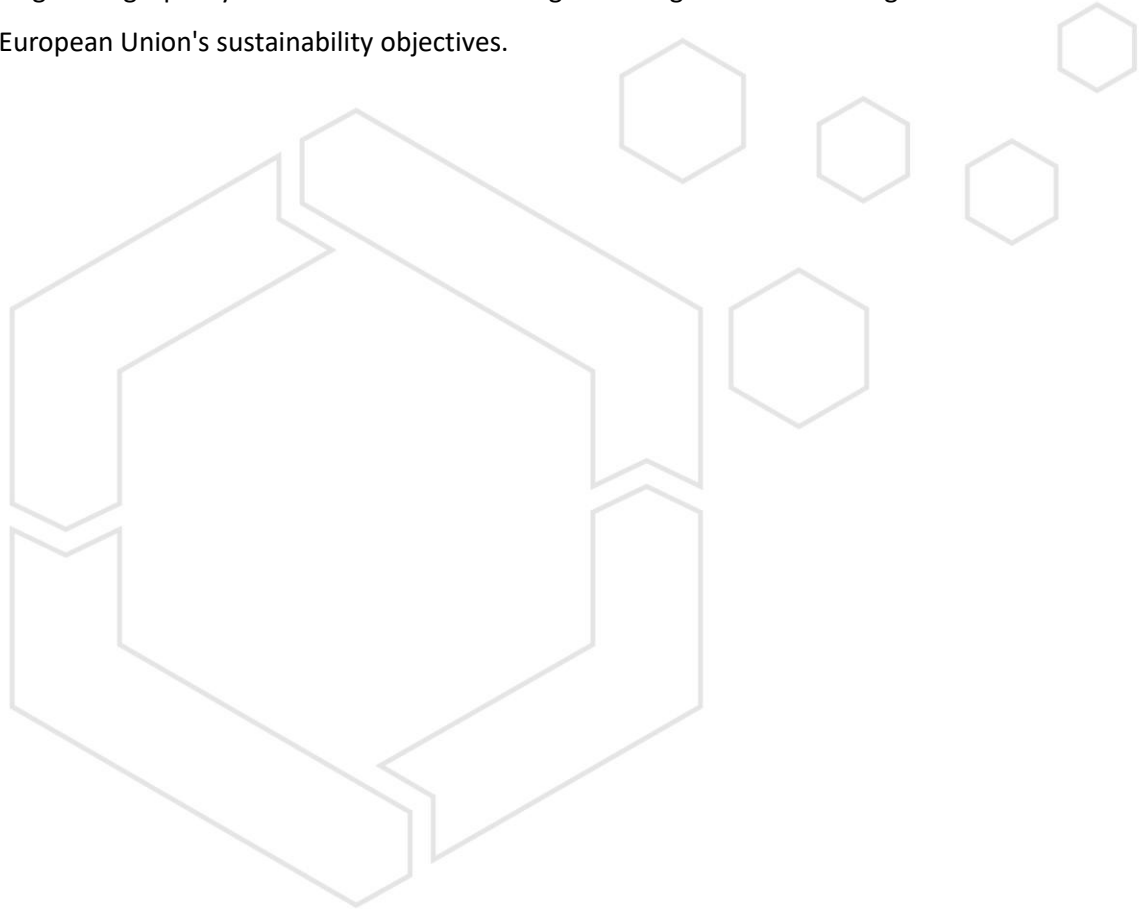
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## Abstract

The AMULET project (Advanced Materials and Manufacturing Technologies united for Lightweight) aims to drive innovation in lightweight materials and technologies, positioning them as key enablers of sustainability and competitiveness in Europe's industrial sectors. By fostering collaboration among clusters, research institutions, SMEs, and policymakers, AMULET seeks to enhance regional capacities for developing advanced lightweight solutions that reduce environmental impact while boosting economic growth. This deliverable consolidates insights from stakeholder interviews and workshops, offering strategic policy recommendations that align with regional innovation goals and contribute to the European Union's sustainability objectives.

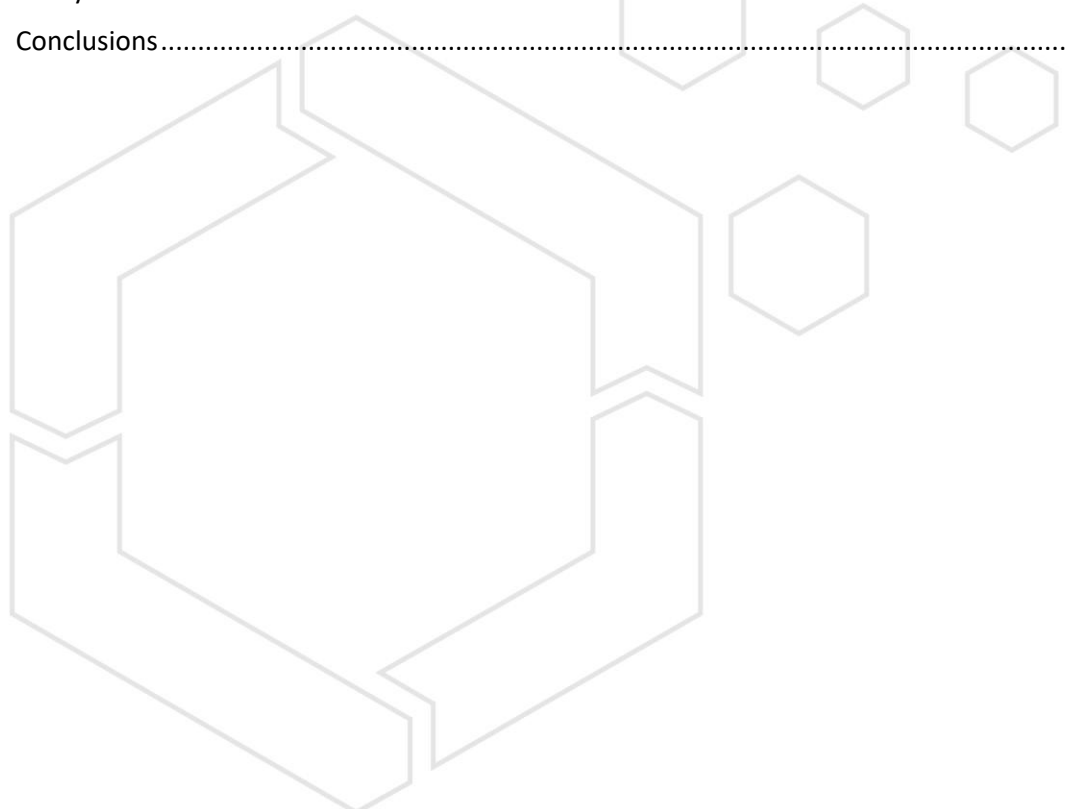


## List of acronyms

Abbreviation / Acronym	Description
AKL	Moravian-Silesian Automotive Cluster
AMULET	Advanced Materials and Manufacturing Technologies united for Lightweight
BAX	Bax Innovation Consulting SL
BIC	Bydgoszcz Industrial Cluster
CMC	Ceramic Matrix Composites
EAB	External Advisory Board
ELCA	European Lightweight Cluster Alliance
IMAST	IMAST Scarl
LMA	Light Metal Alloys
MAV	The Advanced Materials Cluster of Catalonia
MECH	Clust-ER MECH
PBC	Polymer Based Composites
POL	Polymeris
RTO	Research and Technology Organization
SME	Small and Medium-sized Enterprise
SWHEC	Chamber of Commerce and Industry of Pécs-Baranya (on behalf of the South West Hungarian Engineering Cluster)
TUC	TECHNISCHE UNIVERSITÄT CHEMNITZ
TWGE	Thematic Working Group of Experts

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## 1. Introduction

Since the AMULET project places lightweight technologies and materials at the forefront of the transition towards sustainability and circularity across all sectors covered by the initiative, it is imperative that efforts to support innovation in this field extend beyond the project's duration. This entails establishing a foundation for future developments.

In this context, one of AMULET's key objectives is to promote lightweighting and advanced materials as crucial drivers of competitiveness for European industry. To this end, and considering the consortium's strong regional presence due to the involvement of regional clusters, AMULET has undertaken a series of activities aimed at raising awareness among policymakers. These efforts have fostered a dialogue with various stakeholders influencing regional frameworks.

This document aims to lay the groundwork for policy recommendations directed at regional policymakers, with the goal of assessing the strategic importance and economic impact of lightweight materials and technologies within the current industrial ecosystem.

The process of meetings, presentations, and discussions with relevant stakeholders has been aligned with the activities linked to the deliverable "*Technology Roadmap*". This roadmap has been instrumental in consolidating strategic insights from material experts, both from industry and academia, thereby providing a solid foundation of data to analyze:

- Technical challenges that sectors are likely to face in the near future,
- The current state of the art in relevant technologies,
- The development of key enabling technologies.

Following the consortium's establishment of a scientific perspective on the future of lightweighting, it has become possible to present evidence and obtain feedback from public institutions, with the specific objective of analyzing and formulating recommendations.

## 2. Method of working

This deliverable presents a comprehensive analysis of policy recommendations designed to support research and innovation initiatives within regional territories, as undertaken by the AMULET project. The identification of these recommendations involved an extensive consultation process with two primary groups of stakeholders, thereby ensuring that the perspectives and insights gathered are reflective of the diverse needs within the field of advanced materials.

The first group consists of innovation actors in the domain of advanced materials, who actively participated in a series of technological workshops organized in collaboration with Task 1.4 Innovation and Knowledge Management. These workshops provided a collaborative platform for representatives from various sectors to come together and engage in meaningful dialogue. The discussions facilitated within these workshops were instrumental in identifying the main challenges anticipated in each sector's future trajectory, as well as the critical enabling technologies that could potentially serve as solutions to these identified challenges. Through the exchange of ideas and experiences, participants were able to articulate the specific obstacles they face and highlight the technological advancements necessary to foster resilience and competitiveness in their respective fields.

Upon the completion of the workshops, the AMULET partners recognized the importance of extending the dialogue to a second category of stakeholders: policymakers and public authorities. To this end, the consortium meticulously planned and executed a series of interviews with key representatives in this sector. The objective of these interviews was twofold: first, to present the findings from the technological workshops and, second, to gain a deeper understanding of the current state of support mechanisms available for various technological areas. This step was essential for contextualizing the needs expressed by innovation actors within the existing policy frameworks and identifying gaps that could be addressed to enhance support for research and innovation initiatives.

To ensure that the information conveyed was relevant and impactful, the AMULET partners developed a tailored presentation specifically designed for the policymakers and public authorities. This presentation aimed to succinctly communicate the outcomes of the technological workshops while fostering an environment conducive to open discussion about potential policy interventions.

Following the completion of the interviews, a thorough and systematic analysis of the responses was conducted. This analysis not only synthesized the feedback received but also evaluated the implications of these insights for future policy directions. The findings of this analytical process are

compiled in this deliverable, which outlines the main outcomes derived from stakeholder engagement and proposes potential pathways for new initiatives. Through this work, AMULET aims to contribute meaningfully to the discourse on research and innovation support, ultimately fostering a more conducive environment for the development of advanced materials and related technologies.

### 3. Structure of the meeting / interview

The partners actively engaged with representatives from key stakeholders in their respective regions, with the objective of conducting interviews following a presentation on Advanced Materials and Lightweight, the central themes of the AMULET project. The introductory presentation served as a catalyst for defining the primary topics of the interview while providing a comprehensive overview of the lightweight sector and its economic relevance. The presentation was structured as follows:

- 1. Introduction to the AMULET Project**

A brief introduction to the AMULET project was provided to outline its main objectives and activities. The presentation aimed to showcase the consortium and the Open Calls system, which was developed through the identification of industrial challenges, alongside the project's key economic results.

- 2. Lightweight Technologies**

Despite the wide recognition of lightweighting as a crucial technological field with potential benefits for the transitions faced by modern industries, there remains a scarcity of publications on the economic significance of lightweight technologies. Several factors contribute to this challenge, including the absence of a standardized definition of lightweight construction and its cross-sectoral nature, which complicates the measurement of its economic impact.

- 3. Advanced Lightweight Materials Technology Roadmap**

This section presented the Technology Roadmap developed by the AMULET consortium through the organization of four workshops, each focused on a specific sector: Automotive, Aerospace & Aeronautics, Energy, and Building. The purpose of this segment was to identify the technologies currently playing, and those likely to play, a significant role in addressing sector-specific challenges and opportunities.

- 4. The Economic Impact of Lightweight Technologies**



The study titled "The Economic Significance of Lightweight Construction," commissioned by the Austrian Advanced Lightweight Technology (A2LT) initiative and published in 2022, was presented to highlight the dimensions and potential of lightweight technologies in Austria. This study, the first of its kind, evaluated the impact of lightweight technologies on the Austrian economy in terms of Gross Value Added and employment, demonstrating a positive and significant contribution to the country's GDP.

#### 5. **European Trends: Initiatives & Networks**

The final part of the presentation focused on recent European initiatives aimed at positioning lightweight technologies and advanced materials as priorities on the EU agenda. The AMULET partners introduced the European Industrial Leadership on Advanced Materials – published in 2024 – and showcased the most relevant European networks active in this field, including the European Lightweight Clusters Alliance (ELCA), the European Lightweighting Network (ELN), and the European Lightweight Alliance (ELA).

Following the presentation, AMULET partners conducted interviews to assess the significance of lightweight technologies on the regional agenda and explore potential future developments. The interviews centered on the following five questions:

1. Are you aware of the AMULET project and its results?
2. Is lightweight material and/or structural technology prioritized by the regional authority? Does lightweight technology appear in a strategic document of the regional government?
3. From the perspective of competitiveness and sustainability, do you see potential in the development and application of lightweight materials and structures in your region?
  - a. Could regions and countries that prioritize research and development in lightweight technologies achieve a significant and lasting competitive advantage in the global market?
4. Would a study similar to "The Economic Significance of Lightweight Construction" (A2LT publication) be beneficial in improving the understanding of the economic importance of lightweight technologies?
5. Is it feasible for lightweight materials and technologies to be included directly in domestic innovation and economic development strategies (e.g., Smart Specialization Strategies - S3) and to receive dedicated incentives for research, development, and investment subsidies?

Once the responses were collected, the AMULET team proceeded with an in-depth analysis to identify recommendations for addressing the gaps between different regions.

The following institutions have taken part in the study and have been interviewed:

Organization	Acronym	Name Surname	Role	Region – Country	Date of the interview	AMULET partners
Emilia Romagna Region	RER	Andrea Resca	Technical Secretariat Strategic Aerospace Promotion Forum	Emilia-Romagna - Italy	08/07/2024	MECH
ART-ER	ART-ER	Lorenzo Calabri	Research and Innovation High Technology Network and Thematic Chairs	Emilia-Romagna - Italy	30/05/2024	MECH
Saxony Region	SAX	Sven Borner	Speaker in the German Bundestag	Saxony - Germany	20/08/2024	TUC
Kujawsko-Pomorskie Region	WMWKP	Zbigniew Ostrowski	Marshal of Kujawsko-Pomorskie Region	Kujawsko-Pomorskie Region – Poland	06/06/2024	BIC
Bydgoszcz Regional Development Agency	BRDA	Edyta Wiwatowska	President of the Board	Kujawsko-Pomorskie Region – Poland	07/06/2024	BIC
ACCIÓ – Agency for Business Competitiveness	ACCIÒ	Alberto Pezzi	Senior Manager Clusters	Catalunya – Spain	23/09/2024	MAV
Ipark Pécs Ltd.	IPARK	Adam Beimel	Managing director	Southern Transdanubia – Hungary	28/06/2024	SWECH
Moravian-Silesian Innovation Centre	MSIC	Alena Danielová	Chief of RIS Development Team	Moravian-Silesian Region –	24/09/2024	AKL

				Czech Republic		
Alba Industrial Zone Ltd	ALBA INDUSTRIAL ZONE	Andrea Bokor	Technical Manager	Southern Transdanubia – Hungary	13/06/2024	SWECH
University of Pécs	UNI PECS	Csaba Leitol	Department Head	Southern Transdanubia – Hungary	15/07/2024	SWECH
CHIC Central Hungary Innovation Center	CHIC	Miklós Somogyi	Managing Director	Southern Transdanubia – Hungary	02/06/2024	SWECH
ARTI – Apulia Region Agency for Technology and Innovation	ARTI	Jennifer Maria Grisorio	Innovation Economist	Puglia – Italy	27/05/2024	IMAST
Auvergne Rhone Alpes Region	AURA	Florence Charnay + Nadia Kotbi	Research & Innovation Officer Aeronautics / Plastics / Textiles Sectors Officer	Auvergne Rhone Alpes Region - France	12/06/2024	POL
Ministry of Economic Development	MED	Péter Kovács	Head of Department	Southern Transdanubia – Hungary	24/09/2024	SWECH

## 4. Results

The results of the interviews are organized based on the responses to each question asked. Below is a detailed breakdown of the key insights gathered:

### Question n.1: Do you know about the AMULET project and its results?

The responses to the first question reveal a diverse awareness and understanding of the AMULET project among the interviewed stakeholders. Here's a breakdown of the key points derived from the replies:

## General Awareness

### 1. Familiarity with the Project:

- Several stakeholders reported being aware of the AMULET project and its objectives, particularly those associated with innovation networks or clusters (e.g., BIC, MAV, MECH, IMAST).
- Responses from organizations like **ACCIO** and **WMWKP** highlight that they have been actively informed about the project, showcasing effective communication within innovation networks.

### 2. Limited Knowledge:

- A notable number of respondents admitted to only learning about the project during the interviews, indicating gaps in awareness.
- For example, the representatives from University of Pecs and ALBA Industrial Zone explicitly stated they were not familiar with AMULET before the interview.

## Contextual Relevance

### 3. Alignment with Regional Objectives:

- The responses from **MSIC** highlight the strategic importance of the AMULET project in relation to regional innovation goals, particularly in lightweight materials, automotive, and decarbonization efforts.
- This indicates that while awareness may be limited among some stakeholders, those engaged in regional innovation planning recognize the project's relevance to their objectives. For instance, **MED** stated that lightweight technologies should receive more attention in the future, emphasizing not only innovation but also their integration and diffusion throughout the economy, including logistics, production, and recycling phases, to ensure long-term sustainability and lifecycle efficiency.

## Information Dissemination

### 4. Role of Clusters and Networks:



- Stakeholders affiliated with specific clusters (e.g., **MAV**, **BIC**, **IMAST**) demonstrated a more profound understanding of AMULET, suggesting that these networks play a crucial role in disseminating information about such projects.
- The responses imply that strengthening communication channels within and among clusters could enhance overall awareness and engagement with the AMULET project.

### Gaps in Knowledge

#### 5. Need for Broader Communication:

- The varying levels of knowledge among stakeholders underscore the necessity for targeted communication strategies. Some organizations are not sufficiently informed, as seen in responses from **SWECH** and **SAX**, suggesting a potential area for improvement in outreach efforts.

In summary, while many stakeholders are familiar with the AMULET project, there exists a significant portion that lacks detailed knowledge, emphasizing the need for enhanced communication and information dissemination. Stakeholders in positions of influence, particularly those involved with clusters or innovation networks, are more informed and recognize the project's alignment with regional goals. Future efforts could focus on building awareness among those less familiar and leveraging existing networks to facilitate better knowledge transfer regarding AMULET's objectives and outcomes.

**Question n.2 Is light material and/or light structural technology emphasized among the preferences of the regional authority? Does light material and/or light structure technology appear in a strategic document of the regional government?**

The responses to the second question provide insights into the emphasis placed on lightweight materials and structural technologies within regional authorities and their strategic documents. Here's a detailed analysis of the replies:

### Emphasis on Lightweight Technologies

#### 1. Recognition in Strategic Documents:

- Multiple stakeholders confirmed that lightweight materials and structural technologies are recognized in regional strategic documents. For instance, the **WMWKP** highlighted that the Regional Strategy for Intelligent Specialization (RIS3) 2021+ includes “Advanced tools and materials” as a smart specialization area, indicating an alignment with AMULET’s focus.
- Similarly, **ACCIO** pointed out that while lightweight materials are not explicitly categorized, they are integrated into several strategic priorities within the RIS3CAT strategy, particularly in sectors crucial for sustainability and energy efficiency.

## 2. Strong Interest from Regional Authorities:

- Responses from **RER**, **ART-ER** and **SAX** indicate a clear emphasis on lightweight technologies by regional authorities. For example, **SAX** stated that the regional government recognizes the potential benefits of these technologies and is open to exploring legislative adjustments to facilitate their integration.
- **RER** and **ARTI** also noted specific mentions of lightweight technologies within their strategic frameworks, such as the Emilia-Romagna Smart Specialization Strategy and SmartPuglia 2030.
- **MED** highlights that, even if lightweight materials technology represents an only a part of the wider strategic direction that European initiatives and regulations are pursuing, it remains an important area of development.

## Gaps in Awareness and Inclusion

### 3. Limited or No Recognition:

- Some stakeholders, particularly from SWECH (e.g., University of Pecs, ALBA Industrial Zone), expressed a lack of awareness regarding the inclusion of lightweight materials in strategic documents, suggesting a potential disconnect or insufficient communication on these initiatives.
- The response from **IPARK** further emphasizes that lightweight materials do not play a prominent role at the political level in Hungary, indicating a need for better integration of these technologies into the political and strategic discourse.

### 4. Contextual Challenges:



- The response from the **University of Pecs** reflects broader challenges in Hungary, such as the lack of regional self-government, which complicates the identification of a cohesive regional strategy regarding lightweight materials.
- Responses from **MED** noted that the lightweight materials technology should be supported within the critical raw material strategy direction, as it represents a contextual challenge and represents a significant area demanding innovation.

### Integration with Broader Strategic Goals

#### 5. Alignment with Sustainability Goals:

- Many responses pointed to the connection between lightweight materials and broader sustainability objectives. For instance, **AURA** mentioned the inclusion of lightweight materials in their Circular Economy Action Plan, indicating a recognition of its importance in the context of sustainability and innovative materials.

#### 6. Sectors of Focus:

- Stakeholders consistently noted the relevance of lightweight materials across various sectors, including automotive, aerospace, energy, and construction. For example, **AC-CIÒ** highlighted that innovation in lightweight materials is crucial for the digitization of manufacturing and improving energy efficiency.

While there is a notable recognition of lightweight materials and structural technologies in several regional strategic documents, gaps in awareness exist among some stakeholders. Those aware of the strategic emphasis indicate that lightweight technologies align well with regional goals related to sustainability, energy efficiency, and economic competitiveness. However, challenges persist, particularly in regions where the political framework may not fully support or prioritize these technologies. To enhance the impact of lightweight materials on regional development, it will be essential to improve communication and awareness efforts among stakeholders and ensure these technologies are integrated into broader policy frameworks and strategic goals.

**Question n.3 - In terms of competitiveness and sustainability, do you see the potential in the development and application of lightweight materials and structures in the region? Is it possible that regions and countries that deal intensively with the subject and prioritize this direction of R&D can achieve a significant and lasting competitive advantage in the world market?**

The responses to the third question highlight the perceived potential of lightweight materials and structures for enhancing competitiveness and sustainability within various regions. Here's a breakdown of the insights gathered from the replies:

### Potential for Competitiveness and Sustainability

#### 1. High Potential Identified:

- Most respondents recognize a significant potential in the development and application of lightweight materials, particularly in sectors such as automotive, construction, and aerospace. For instance, **ACCIO** emphasized that lightweight materials are crucial for reducing energy costs and improving efficiency, which aligns with the sustainability goals of their region.
- **WMWKP** and **IPARK PECS** echoed this sentiment, noting the advantages of lightweight materials in reducing production and logistics costs, leading to competitive pricing and innovative solutions.

#### 2. Alignment with Regional Strategies:

- Several respondents indicated that their regions have strategic frameworks prioritizing R&D in lightweight materials, such as the **RIS3CAT** strategy in Catalonia, which aims to drive innovation and sustainability in key sectors. This strategic focus is believed to foster competitiveness and support the transition to greener economies.

#### 3. Importance of Collaboration:

- **RER, ART-ER, MED** and **AURA** highlighted the necessity of collaboration between research institutions and industry to capitalize on the potential of lightweight materials. Effective partnerships can drive innovation and ensure that regional companies remain competitive on a global scale.
- In particular, **MED** noted that need for SMEs to shift towards a culture of innovation and openness which could bring high value to the territorial industry and economy.

### Competitive Advantage through R&D

#### 4. Achieving Competitive Advantage:

- Multiple stakeholders, including **ACCIO** and **SAX**, expressed confidence that regions and countries prioritizing R&D in lightweight materials can achieve significant and



lasting competitive advantages. They noted that this could position them as leaders in sectors crucial for the transition to sustainable practices, setting global standards and attracting international investments.

- **MSIC** also pointed to the region's focus on decarbonization as a strategic advantage in fostering green technology, aligning with global trends.

#### 5. Interconnectedness of Sectors:

- **ARTI** and **ALBA INDUSTRIAL ZONE** emphasized that the development of lightweight materials can enhance innovativeness across various sectors, creating synergies and allowing for cross-sector collaboration. This interconnectedness can lead to more robust regional innovation ecosystems.

### Challenges to Achieving Competitive Advantage

#### 6. Potential Barriers:

- Despite the optimism, some responses, particularly from **UNIVERSITY OF PECS**, noted that achieving significant and lasting competitive advantages depends on broader factors beyond just R&D. These include the quality of education, infrastructure, government policies, and the economic environment.
- **RER** highlighted the need for improved dialogue between production sectors and R&D to fully leverage lightweight materials for competitive advantage.

#### 7. Need for Sustained Efforts:

- **TUC** stressed the importance of persistent advocacy and long-term commitment to overcome bureaucratic inertia and create an environment conducive to innovation. This is critical for establishing regional clusters that support technological development.

In summary, the responses collectively indicate a strong belief in the potential of lightweight materials and structures to enhance regional competitiveness and sustainability. Stakeholders recognize that regions focusing on R&D in this area can secure significant advantages in the global market, particularly through innovation in key sectors like automotive and aerospace. However, achieving these advantages will require collaborative efforts between industry and research institutions, as well as broader economic and policy considerations. Challenges such as bureaucratic inertia and the need for

improved communication within sectors should be addressed to fully realize the potential benefits of lightweight materials.

**Question n.4 Would you think that having a study similar to the one shown (The economic significance of lightweight construction – A2LT publication) could be useful to improve the understanding of the economic importance of lightweight?**

The responses to the fourth question indicate a strong consensus among stakeholders regarding the utility of a study similar to "The Economic Significance of Lightweight Construction." This analysis highlights the perceived benefits of such research and the areas where it could make a significant impact.

#### **Importance of Understanding Economic Impact**

##### **1. Awareness of Economic Benefits:**

- Many respondents emphasized that a comprehensive study could enhance understanding among policymakers and industry stakeholders about the economic significance of lightweight materials. **ACCIÒ** pointed out that a well-structured report could quantify economic impact, identify market opportunities, and promote collaboration across industries, thereby raising awareness about sustainability.

##### **2. Need for Policy Awareness:**

- **IPARK PECS** and **ALBA INDUSTRIAL ZONE** noted that while the importance of lightweight materials is recognized in product development, there is a gap in awareness at the industrial and regional policy levels. A detailed study could inform authorities about the broader economic implications, encouraging them to consider lightweighting as a strategic area for investment and development.

##### **3. Supporting Strategic Frameworks:**

- Respondents like **ARTI** and **AURA** that such studies could complement existing regional strategies (e.g., RIS3) by enriching the information framework with data on technological evolution and economic impact. This could strengthen regional policies and initiatives aimed at promoting lightweight materials.



## Facilitating Collaboration and Innovation

### 4. Encouraging Collaboration:

- **TUC** highlighted that studies like the A2LT report could facilitate better collaboration among science, industry, and politics. By providing valuable data and insights, such studies can build a case for the benefits of lightweight technologies and promote dialogue between stakeholders, which is essential for translating insights into actionable policies.

### 5. Informing Industrial Policy:

- **MSIC** emphasized that a detailed economic study could provide crucial insights into how lightweight materials contribute to regional growth, job creation, and international competitiveness. This could be vital for shaping industrial policies that prioritize lightweight technologies.

### 6. Fostering Understanding among Policymakers:

- **ART-ER** noted that the study would likely be more beneficial for policymakers, helping them understand the importance of supporting sectors that utilize lightweight materials. In contrast, industry stakeholders might already be aware of the importance but could benefit from consolidated data.

## Broader Implications

### 7. Addressing Gaps in Knowledge:

- Some respondents, including **UNIVERSITY OF PECS**, simply affirmed the utility of such studies without elaboration, indicating a general consensus on the need for more research and data in this area.

### 8. Highlighting Spill-Over Effects:

- **ALBA INDUSTRIAL ZONE** mentioned that the potential benefits of lightweighting could have spill-over effects that are currently underestimated. A comprehensive study could help elucidate these effects, encouraging a more holistic view of the economic importance of lightweight technologies.
- **MED** noted that a potential evolution of the study should cover the entire life cycle of the product (including its final reuse or destruction fate after operation) and its wide-ranging economic, social and environmental impacts.

The responses collectively demonstrate a strong belief in the value of conducting a detailed study similar to "The Economic Significance of Lightweight Construction." Stakeholders see it as a vital tool for raising awareness about the economic impact of lightweight materials, informing industrial policy, and fostering collaboration among various sectors. Additionally, such research could address existing gaps in knowledge, support regional strategies, and ultimately drive innovation and investment in lightweight technologies.

**Question n.5 - Is it a realistic idea for light materials and technologies to appear directly in domestic innovation and economic development strategic documents (for instance S3) and to receive real incentives in the field of research and development and investment subsidies?**

The responses to the fifth question reveal a strong consensus among stakeholders that including lightweight materials and technologies in domestic innovation and economic development strategies, such as Smart Specialization Strategies (S3), is realistic. The answers reflect optimism about receiving incentives for research and development and investment subsidies, although they also acknowledge existing challenges.

**Feasibility and Recognition**

**1. General Agreement on Realism:**

- Many respondents, including **ACCIO** and **MSIC**, affirmed that it is realistic for lightweight materials and technologies to be incorporated into S3. They emphasized the alignment of lightweighting with sustainability goals and its potential economic impacts, which could attract investments and funding for R&D.

**2. Support from Existing Strategies:**

- **WMWKP** and **ART-ER** pointed out that lightweight materials are already featured in existing regional strategies and documents, underscoring the feasibility of further inclusion and the potential for receiving R&D incentives. For example, the inclusion of materials for additive manufacturing and structural lighting in S3 demonstrates a willingness to support innovation in this domain.



## Importance of Advocacy and Awareness

### 3. Need for Awareness Among Decision-Makers:

- Respondents such as **IPARK PECS** and **ALBA INDUSTRIAL ZONE** highlighted the importance of raising awareness among decision-makers about the significance of lightweight technologies. The realization of incentives and support for lightweight materials depends heavily on engaging those who shape policy and understanding the funding opportunities available at the EU level.

### 4. Bottom-Up Initiatives:

- **ALBA INDUSTRIAL ZONE** also mentioned that bottom-up initiatives could influence mainstream thinking and help set innovation and economic development goals, further supporting the case for lightweight technologies.

### 5. Information Materials:

- **UNIVERSITY OF PECS** noted that information materials, such as concise studies and briefings, would be essential for decision-makers to prepare effective strategies and emphasize the significance of lightweight materials.

## Challenges to Realization

### 6. Existing Barriers:

- Some stakeholders acknowledged potential challenges. For instance, **RER** expressed concerns about the realistic nature of receiving investment subsidies for lightweight materials, suggesting that their association with specific business sectors might limit broader recognition and support.

### 7. Bureaucratic Challenges:

- **SAX** highlighted the complexities of investment backlogs, strained budgets, and excessive bureaucracy as existing barriers. However, the growing recognition of the importance of innovation in lightweight technologies makes the inclusion of these technologies in strategic documents more plausible.

## Support from Funding Initiatives

### 8. Access to Regional Funds:

- **ARTI** pointed to regional funds dedicated to financing initiatives related to innovation areas identified in strategies like SmartPuglia 2030, suggesting that access to funding for lightweight materials is indeed possible.

#### 9. Investment in Advanced Materials:

- **AURA** mentioned that while there may not be a strong focus specifically on lightweight materials, there is ongoing investment in innovative advanced materials within strategic industrial sectors. This highlights a pathway for indirect support for lightweight technologies.

The consensus among stakeholders is that including lightweight materials and technologies in domestic innovation and economic development strategies, such as S3, is a realistic idea that could garner real incentives for research and development. Many respondents emphasized the alignment of lightweighting with sustainability goals and its economic potential, which could attract investments and funding. However, awareness among decision-makers, the need for information materials, and addressing bureaucratic challenges are crucial for realizing this potential. Overall, there is optimism about the possibility of achieving tangible support for lightweight materials and technologies within strategic documents.



## 5. Findings

The insights gathered from the interviews with various stakeholders reveal several critical points regarding the potential for lightweight materials and technologies to significantly contribute to regional innovation and economic development. These findings can serve as a compelling introduction to the proposed policy recommendations:

### 1. Economic Importance of Lightweight Materials

Stakeholders across different regions acknowledge the pivotal role of lightweight materials in driving industrial efficiency, reducing costs, and enhancing sustainability, particularly in sectors such as automotive, aerospace, and construction. The reduction in energy consumption and emissions linked to lightweighting presents an undeniable environmental benefit. However, despite these advantages, the full economic potential of lightweight materials is often overlooked. This is partly due to the absence of comprehensive, sector-wide data on their economic impact and the variability in how lightweight materials are defined across regions and industries. Several stakeholders expressed the need for more granular economic studies, similar to the Austrian "Economic Significance of Lightweight Construction" report, to quantify the specific contributions of lightweight materials to Gross Added Value (GAV), job creation, and sectoral competitiveness.

### 2. Strategic Alignment with Regional and European Goals

A consistent theme in the interviews was the alignment of lightweight technologies with both regional innovation strategies and broader European Union sustainability objectives. Regions where lightweight materials are included in Smart Specialization Strategies (S3) or similar frameworks have witnessed significant strides in promoting R&D in this area. For instance, the Emilia-Romagna region explicitly includes lightweight technologies within its S3, while Catalonia's RIS3CAT framework supports lightweight materials in sectors related to energy efficiency and manufacturing digitization.

Despite these examples, the inclusion of lightweight technologies in strategic documents is not yet universal. Several stakeholders noted the absence of lightweight materials in their regional strategies, pointing to a need for better integration of these technologies into local policy frameworks. The integration of lightweight technologies into strategic documents not only raises their profile but also opens up pathways for dedicated funding and increased collaboration across sectors.

### 3. The Potential for Competitive Advantage

The interviews revealed a strong belief that regions prioritizing research and development in lightweight materials have the potential to secure a lasting competitive advantage in the global market. Stakeholders noted that regions with strategic investments in lightweighting would likely be

better positioned to meet the demands of sustainability and cost-efficiency, making them more attractive to global investors and partners.

However, several challenges were identified, particularly regarding the need for stronger collaboration between industry and research institutions. Regions like Saxony and Moravian-Silesian have started to capitalize on the competitive edge that lightweight materials offer through decarbonization initiatives and innovation ecosystems. In contrast, some regions, particularly in Central and Eastern Europe, face structural barriers such as insufficient communication between policymakers and innovators or limited political recognition of the sector's potential.

#### **4. Collaboration as a Driver for Innovation**

Collaboration across sectors was highlighted as a vital mechanism for maximizing the impact of lightweighting. Stakeholders frequently emphasized the importance of creating networks and partnerships that bring together industrial players, research institutions, and government bodies. These networks can facilitate knowledge exchange, resource-sharing, and joint problem-solving, which are essential for overcoming the technological and regulatory hurdles facing the adoption of lightweight technologies.

The AMULET project's workshops and thematic discussions have already laid the groundwork for such collaborations. However, stakeholders noted that further efforts are needed to institutionalize these partnerships within regional innovation systems, ensuring that lightweighting becomes an integral part of cross-sectoral innovation initiatives.

#### **5. Awareness and the Role of Policymakers**

A recurring challenge identified in the interviews is the varying levels of awareness among policymakers regarding the strategic importance of lightweight materials. While industry stakeholders and innovation clusters have a deep understanding of the benefits associated with lightweighting, this knowledge has not always permeated public institutions or regional authorities. This gap in awareness hinders the ability to secure dedicated funding or implement supportive policies.

Stakeholders stressed the need for targeted educational campaigns and information dissemination aimed specifically at policymakers. These efforts should focus on providing clear, accessible data on the economic and environmental benefits of lightweight materials, supported by case studies and success stories from regions where lightweighting has been integrated into policy frameworks.

#### **6. Funding and Incentive Mechanisms**



The interviews underscored the importance of establishing dedicated funding streams and incentives for research and innovation in lightweight technologies. While regions like Emilia-Romagna and Catalonia have successfully integrated lightweighting into their R&D funding frameworks, other regions reported a lack of financial support. Stakeholders noted that without targeted funding, the development of lightweight materials will remain constrained by resource limitations, particularly for small and medium-sized enterprises (SMEs).

Several respondents called for the establishment of grants, tax incentives, and subsidies aimed at fostering innovation in lightweight materials. These financial tools are seen as crucial for lowering barriers to entry and encouraging companies, particularly SMEs, to invest in lightweighting. The interviews also revealed a strong consensus that lightweighting should be included in broader funding programs, such as those related to sustainability and the green economy.

### **7. Job Creation and Socioeconomic Benefits**

The potential for lightweight technologies to generate new employment opportunities was a key finding from the interviews. Stakeholders recognized that promoting innovation in lightweight materials could lead to the creation of high-skilled jobs, particularly in advanced manufacturing, research, and development. This job creation potential could play a critical role in garnering public support for lightweight initiatives and in justifying further investment by policymakers.

However, stakeholders emphasized that to fully capitalize on these employment opportunities, regions will need to invest in education and skills development programs that are aligned with the specific needs of the lightweight sector. This includes offering specialized training in advanced materials science, manufacturing processes, and sustainability-focused engineering disciplines.

## **6. Policy Recommendations**

The policy recommendations derived from the findings of the AMULET project and stakeholder interviews are designed to enhance the development and implementation of lightweight materials and technologies across European regions. These recommendations provide strategic directions for policymakers and regional authorities to capitalize on the economic, environmental, and competitive potential of lightweighting.

### **6.1 Commission Comprehensive Economic Studies on Lightweight Materials**

A foundational recommendation is the need for comprehensive economic studies to quantify the impact of lightweight materials on key economic indicators such as Gross Added Value (GAV), job creation, and sectoral competitiveness. These studies, similar to the Austrian "Economic Significance of Lightweight Construction" report, should provide detailed data and insights to support informed decision-making by policymakers. By showcasing the tangible benefits of lightweighting, such studies can enhance the visibility of lightweight materials in regional and national policy discussions, making the case for further investment and support.

Such economic reports would also provide valuable input for regions to tailor their innovation strategies and demonstrate to industries the economic and competitive advantages of lightweighting, particularly in high-value sectors like automotive, aerospace, and construction.

### **6.2 Integrate Lightweight Materials into Strategic Regional Documents**

To fully realize the benefits of lightweight technologies, they must be explicitly integrated into regional innovation and economic development strategies, including Smart Specialization Strategies (S3). Including lightweighting in these frameworks will ensure it receives the necessary attention and resources from policymakers and innovation agencies.

Policymakers should prioritize lightweight materials within broader regional sustainability goals. This integration will help attract investment, foster collaboration across sectors, and create synergies between public authorities, research institutions, and industrial stakeholders. Such strategic alignment also facilitates access to EU-level funding, further accelerating regional innovation and competitiveness.

### **6.3 Foster Cross-Sectoral Collaboration and Networks**

Collaboration between different sectors is vital for the success of lightweight technologies. Policymakers should encourage the establishment of cross-sectoral networks and partnerships that involve industries, research organizations, universities, and governmental bodies. These collaborations should focus on sharing knowledge, resources, and best practices to drive technological advancements and overcome challenges in lightweighting.

AMULET's success in organizing workshops and fostering dialogue between stakeholders demonstrates the potential of these partnerships. Regular forums, conferences, and joint research initiatives could further strengthen these collaborations, ensuring that lightweighting remains a priority in regional and national innovation ecosystems.

#### **6.4 Develop Tailored Funding Mechanisms and Incentives**

Dedicated funding mechanisms and incentives are essential for promoting research, development, and commercialization of lightweight technologies. Policymakers should explore the creation of grants, tax incentives, and subsidies that specifically target lightweight materials. These financial tools can lower entry barriers for SMEs and startups, encouraging them to invest in lightweight technologies and develop innovative solutions.

It is also critical that these funding mechanisms be integrated into broader sustainability and circular economy initiatives. By aligning lightweighting with green transition goals, regions can attract additional EU and private-sector funding, supporting long-term growth and innovation in the field.

#### **6.5 Raise Awareness and Provide Educational Support for Policymakers**

A key finding from the interviews is the lack of awareness among some policymakers regarding the economic and environmental benefits of lightweight materials. To address this gap, targeted educational campaigns should be developed, aimed at informing decision-makers about the advantages of lightweighting and the strategic importance of supporting it.

These campaigns could include the dissemination of concise, data-driven materials that highlight case studies of successful lightweighting initiatives. Public authorities and regional clusters should work together to organize training sessions and information seminars tailored to policymakers, ensuring they are well-equipped to advocate for lightweighting within their strategic documents and funding programs.

#### **6.6 Integrate Lightweight Materials into Environmental and Circular Economy Policies**

Lightweight technologies play a crucial role in reducing energy consumption, lowering greenhouse gas emissions, and promoting resource efficiency. As such, they should be integrated into broader environmental and circular economy policies at both regional and national levels. This integration will support initiatives aimed at decarbonizing industries and transitioning to more sustainable manufacturing practices.

Policymakers should also consider lightweighting when designing programs that address the EU's Green Deal and climate neutrality goals. By embedding lightweight materials into environmental strategies, regions can better position themselves to attract funding for sustainability initiatives and contribute meaningfully to the green transition.

#### **6.7 Emphasize Job Creation and Skills Development**



The potential for job creation in the lightweighting sector should not be overlooked. Regions should emphasize this aspect in their innovation strategies, highlighting how investment in lightweight materials can lead to the creation of high-quality, specialized jobs. This is particularly relevant for regions with a strong focus on advanced manufacturing and engineering sectors.

To fully harness this potential, regions must also invest in education and skills development programs that align with the needs of the lightweight sector. Offering specialized training in lightweight technologies, materials science, and sustainable manufacturing practices will ensure that the workforce is prepared to meet the demands of this rapidly evolving field.



## 7. Conclusions

The AMULET project has demonstrated that lightweight materials and technologies have the potential to drive significant innovation, economic growth, and sustainability across Europe. Through extensive stakeholder engagement and analysis, the findings clearly show that lightweighting offers transformative benefits, particularly in high-impact sectors such as automotive, aerospace, and construction.

However, realizing these benefits requires coordinated and strategic action from policymakers, industry stakeholders, and research institutions. The policy recommendations presented in this document provide a comprehensive roadmap for regions looking to capitalize on the opportunities that lightweight materials present.

First, the need for detailed economic studies is essential to quantify the impact of lightweighting on regional economies, providing evidence-based insights to support strategic decisions. Integrating lightweighting into regional innovation strategies and environmental policies will further raise its profile and ensure that it receives the necessary financial and political support.

Cross-sectoral collaboration is critical for overcoming the technological and regulatory challenges that hinder the widespread adoption of lightweight materials. Establishing networks and partnerships that bring together industries, research bodies, and public authorities will drive technological advancements and foster innovation.

Funding and incentives remain pivotal to lowering the barriers to entry for companies, particularly SMEs, and ensuring that lightweight technologies continue to evolve and remain competitive on a global scale. Policymakers should actively seek to embed lightweighting within broader funding programs related to sustainability and the circular economy.

Raising awareness among policymakers and emphasizing the job creation potential of lightweight materials will help garner public and political support. Education and skills development programs will be crucial in preparing a workforce that is capable of supporting the growth of the lightweight sector.

In conclusion, lightweight materials offer a clear pathway for Europe to strengthen its competitive edge, achieve its sustainability goals, and create new economic opportunities. As this document sets the basis for potential policy recommendations, policy makers can plan initiatives and actions to unlock the full potential of lightweighting, contributing to a greener, more innovative, and economically robust Europe.



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