



Shaping the Future with Advanced Lightweight Materials in the Building Sector



AS PART OF THE AMULET TECHNOLOGY ROADMAP



The AMULET has received funding from the European Union's Horizon 2020 INNOVATION Programme under grant agreement No 101005435.

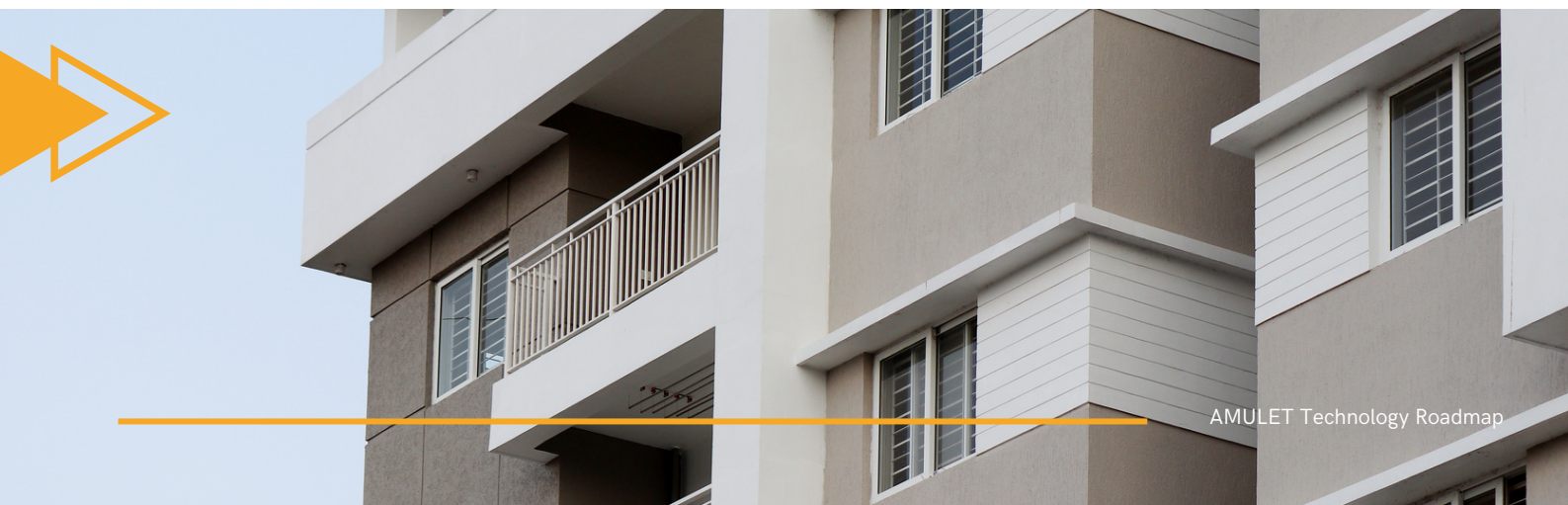
► Introduction

The tremendous increase in anthropogenic CO₂ emissions arose after the Industrial Revolution until our days are bringing undesired climate changes at a rate steeper than predicted. Although still unpredictable, the effects of these changes will impose important stresses on Earth's ecosystems and measures to mitigate these effects are being put in place.

European Climate Law includes a set of measures targeting net greenhouse gas emissions reductions of at least 55% by 2030, compared to 1990 levels, aiming to make Europe climate neutral by 2050. These changes will involve the radical transformation of multiple value chains, from material development to the product's End-of-Life. In this context, advanced lightweight materials will play a critical role in providing solutions for many applications to drive the green and digital transition. In fact, lightweight materials have been identified as relevant enablers for nine selected Materials Innovation Markets representing the 'market pull' to address the societal needs and citizen challenges sustainably in the long term.

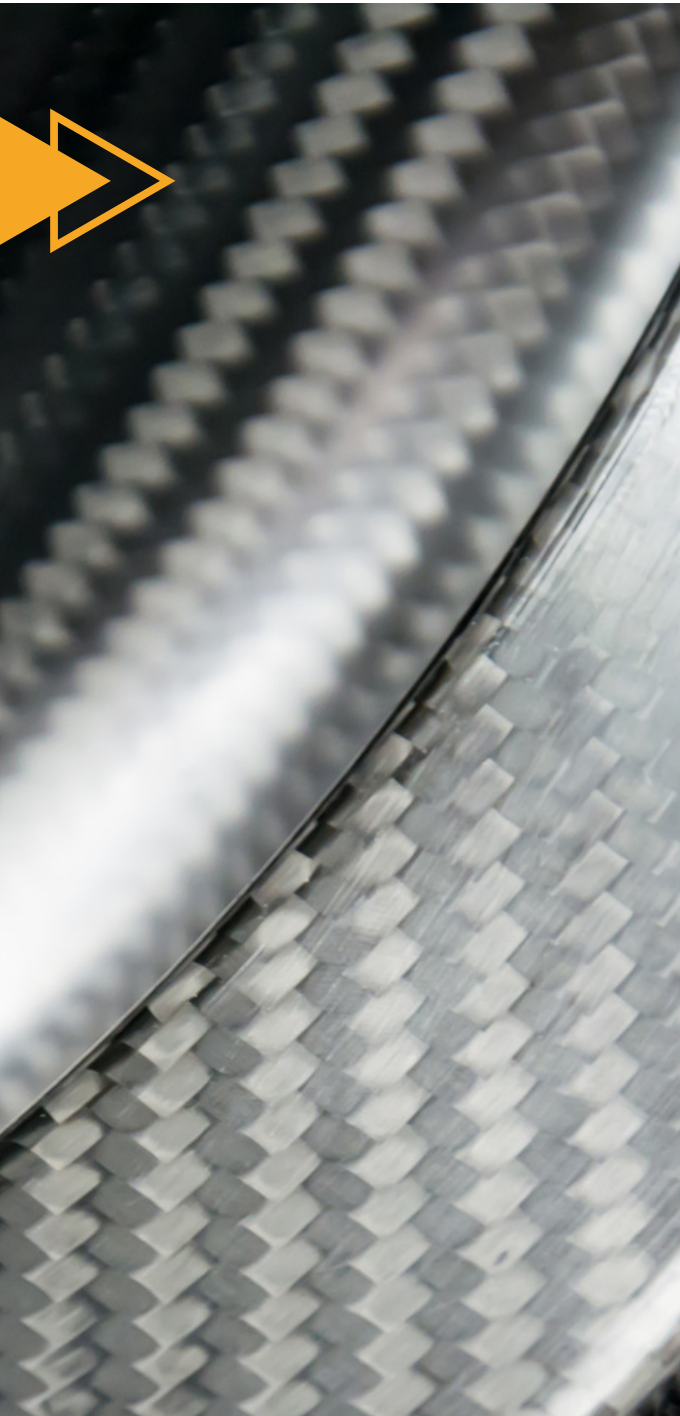
AMULET's technology roadmap aims to inform decision-makers about the drivers, challenges and innovations related to lightweight materials in four different industrial sectors: Automotive, Aerospace, Energy and Building. This information will provide relevant technological insights about the developments being made in these sectors, allowing the elaboration of better policies as well as providing recommendations on which developments are more suitable to be financed.

The information used for the elaboration of this technology roadmap comes from a series of four sectoral workshops (one per sector) which have involved relevant stakeholders with expertise in the different stages along the value chain. The information has been completed with a detailed bibliographic search.



► The Building sector

The construction sector is known for its energy-intensive nature, demanding vast amounts of raw materials and natural resources. This leads to significant environmental impacts, notably CO₂ emissions. Additionally, the sector generates considerable waste and often operates inefficiently in terms of energy. In response, the industry is placing a higher emphasis on sustainability, focusing on life cycle assessments, minimising environmental impacts, and using recyclable, energy-efficient products.



However, challenges persist. Composites are difficult to recycle; there's a reliance on raw materials from distant countries; long-term performance materials are essential; and there's a need to adapt to climate change. Research offers potential solutions, such as the development of new products designed for end-of-life recycling, local sourcing of raw materials, and the introduction of self-healing materials. These strategies aim to decrease greenhouse gas emissions, improve energy efficiency, and bolster overall sustainability.

Regulatory requirements for the construction sector are also indispensable. These regulations highlight challenges like energy inefficiency from raw material extraction to a building's lifespan and the standards that ensure fire resistance, critical for both human and structural safety.

The materials cost is comparably high and can be reduced with the use of lightweight materials, hence reducing the transport costs, and facilitating faster and more feasible installations, resulting in lower labour costs and shorter construction timelines.



Materials in the construction sector come at a significant cost. The durability and performance of construction materials are paramount to ensure longer building lifespans and decrease the frequency of repairs and replacements. This reduces maintenance costs and ensures the resilience of structures against severe environmental conditions and natural disasters. One major advantage of lightweight materials is the speed and efficiency they bring to construction processes, offering potential savings in labor and transportation whilst also opening doors for more innovative designs. However, when transitioning to a new material, it's crucial to ensure it can bear the expected loads and forces.

In summary, the construction sector is increasingly leaning towards lightweight materials and technologies, prioritising the performance and durability of materials, cost savings, and regulatory and sustainability considerations.

AMULET's technology roadmap will provide insightful information on challenges and innovations related to the sectoral drivers. The full technology roadmap will be available in 2024.



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