

Affordability & Competitiveness

EXECUTIVE SUMMARY

Overview

EUCAR's members, the European automotive manufacturers, strive for a competitive industry whose products meet the needs of society. European collaborative research & innovation (R&I) supports this strategic objective by enabling cooperation between stakeholders and providing co-funding to mitigate part of the risk inherent in automotive research. In the area of Affordability & Competitiveness, co-funded research supports the development of technologies which support a competitive automotive industry, producing affordable passenger and commercial vehicles meeting customer and societal demands, whilst fulfilling ever more stringent regulatory standards.

The EUCAR R&I roadmaps define the strategic recommendations of the manufacturers for collaborative R&I, detailing the necessary topics for R&I projects aligned with the strategic objectives. They are a vital and unique contribution, since they represent the outlook of the manufacturers, who themselves have the ultimate responsibility to innovate in bringing the resulting technologies to market.

In Horizon 2020, the programmes on "Leadership in Enabling and Industrial Technologies" and "Smart, Green and Integrated Transport" are of direct relevance to R&I in Affordability & Competitiveness. The roadmaps for Affordability & Competitiveness present recommendations for collaborative R&I in three areas: "Application of Suitable Materials for Future Vehicles", "Virtual Engineering Product Process" and "Sustainable & Efficient Manufacturing".

For interior materials, collaborative research should concentrate on improvements in functionality, appearance, stability and acoustics as well as integration into the production process. For lightweight vehicles, priorities include new materials, shapeability, joining, sheet forming and again integration into the production process. In manufacturing, R&I priorities enhance productivity through collaboration and automation including safety, surveillance, tracking, reflexes and algorithms. Advances in different levels of robotics assistance are important, covering co-manipulation, assistant tools and full automation of heavy processes. Also in the factory, energy and resources efficiency of plants, including planning, renewables use and recovery are key areas of R&I focus. These activities can be supported by the deployment of advanced virtual engineering, including simulation, modelling and assessment.

The expected outcome from these activities is a technology readiness for automotive materials and for manufacturing technologies that provides a platform for further development and eventual industrialisation. The final target is to support the fulfilment of customer demands for automotive vehicles which are affordable and continue to meet their needs and expectations on functionality, quality and safety. This is integrated with the fulfilment of societal and regulatory demands on vehicles, and supports a competitive European industry which, as well as providing valuable products, is a key part of the industrial landscape providing jobs and wealth to the continent and its regions.

The Strategic Framework for Automotive Research & Innovation

EUCAR’s members have analysed in depth the strategic motivation for performing research and innovation (R&I) activities and specifically collaborative R&I, in order to set out a future vision for these activities. The following questions need to be answered: “why is collaborative automotive R&I important?”, “what should policy makers and stakeholders expect to gain from EUCAR’s roadmaps and this summary, and how is it related to Horizon 2020?”. The motivation and the answers to these questions can be considered in terms of three strategic elements at different levels of detail:

- **The main relevant Strategic Trends**: these set the context for long-term strategy and have been identified by EUCAR’s members as the long-term global driving forces and trends which motivate change and require identification of the key automotive R&I themes.
- **Overall Objectives** for automotive R&I: aligned with the broader policy perspective (aiming at Sustainable Transport and Competitive Industry) and the constituent programmes of Horizon 2020, these include:
 - i. EU Industrial Policy “Industrial revolution brings industry back to Europe“;
 - ii. The Horizon 2020 programmes “Leadership in Industrial and Enabling Technologies” and “Smart, Green and Integrated Transport”.
- **Priority R&I Focus Areas**: these represent the key areas of R&I for the automotive sector, identified by the European automotive manufacturers through their collaborative activities in EUCAR.

These are highlighted and represented graphically in the following chart, which represents this strategic outlook in the domain of Affordability & Competitiveness:

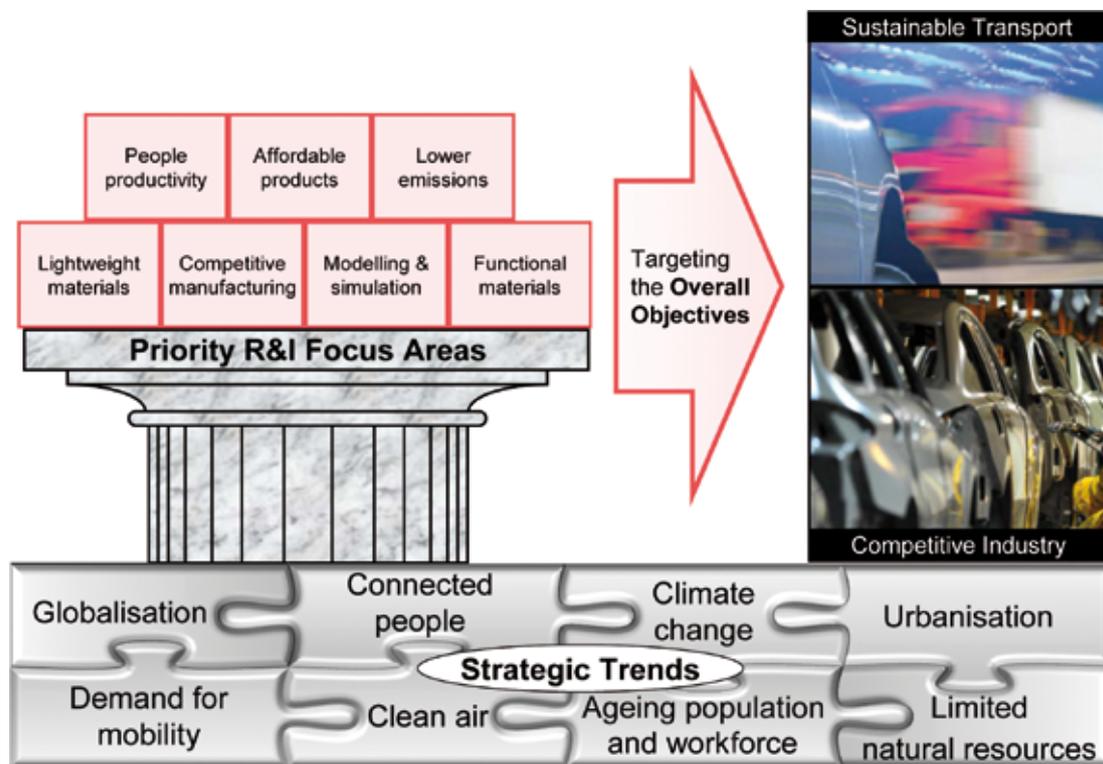


FIGURE 1 Strategic framework for Affordability & Competitiveness

The key R&I priorities in Affordability & Competitiveness are derived from this analysis, directly from the need to meet societal and industrial challenges, within the global strategic framework of prevailing conditions and trends. These priorities relate to the need continually to improve efficiency and productivity of production whilst increasing flexibility to meet intensifying customer demands and enabling the production of future vehicles with new technologies meeting stringent regulations.

The EUCAR Strategic Vision for Collaborative R&I

Derived from the above strategic framework, the statements presented below represent the strategic vision of the European automotive manufacturers in the domain of Affordability & Competitiveness. They are to be considered as an expression of the ambition of the manufacturers in meeting future societal and industrial objectives. They also represent a motivating objective for the definition and performance of research and innovation activities by EUCAR's members.

The statements include an overall vision statement for Affordability & Competitiveness and three statements, each representing the strategic vision for part of the domain. This subdivision indicates the breakdown of the Affordability & Competitiveness domain from the automotive manufacturers' point of view into three vertical themes "Application of suitable materials for future vehicles", "Virtual engineering product process integrated approach" and "Sustainable and Flexible Manufacturing". For each of these themes a EUCAR R&I roadmap has been compiled.



FIGURE 2 EUCAR Research & Innovation Strategic Vision for the Strategic Pillar "Affordability & Competitiveness"

EUCAR Research & Innovation Roadmaps and Milestone Objectives

In order to create a productive link between the automotive manufacturers’ strategic vision and their priorities for collaborative research and innovation, milestones have been compiled, representing the objectives to be reached by technology at different levels of readiness.

Milestones and R&I priorities are described in EUCAR’s roadmaps. In particular, industrialisation milestones have been compiled, representing the objective for the industrialisation of the technology on the market, derived from the Strategic Vision and relevant indicators.

Industrialisation milestones can be considered as a more detailed expression of elements of the strategic vision and are listed below:

- A&C1:** “A reduction in per-vehicle CO2 emissions contributing to the fulfilment of future regulatory standards”
- A&C2:** “A significant increase in the capacity for individual production systems, facilities or lines to meet changing or volatile demands for differentiated products.”
- A&C3.1:** “A substantial increase in the annual gain in production efficiency measured by number of vehicles produced per man-hour (compared to 2000-2010) for equivalent level of production.”
- A&C3.2:** “A substantial decrease in the proportion of older workers removed from the production line due to physical limitations.”
- A&C4:** “A substantial reduction in the full-cycle production and delivery cost differential between the EU and important developing countries.”
- A&C5:** “A substantial increase in the annual gain in plant energy efficiency measured by kW-hours per vehicle produced (compared to 2000-2010) for equivalent level of production.”
- A&C5.2:** “A substantial reduction in material waste per vehicle.”
- A&C5.3:** “A substantial reduction in tonne-km transport needs per vehicle during the production process.”
- A&C6:** “A substantial decrease in the number of serious injury-causing incidents per million hours of work.”

In the domain of Affordability & Competitiveness, the following five roadmaps have been compiled:

1. Materials, technologies and process for interiors
2. Materials, technologies, process and simulation tools for lightweight vehicle structure
3. People productivity: Collaboration and automation (robots, ergonomics and aging workforce)
4. People productivity: Ergonomics and automation (including aging workforce)
5. Energy and resource-efficient plants

In this domain, the corresponding elements of the proposed Specific Programme Horizon 2020 have been identified, as well as the relevant public-private partnerships:

EUCAR Strategic Pillar	Horizon 2020 Specific Programme	Public-Private Partnerships
Affordability & Competitiveness	<p>Smart, Green & Integrated Transport:</p> <p>4.1 Resource-efficient transport that respects the environment</p> <p>4.3 Global leadership for the European transport industry</p> <p>Leadership in Enabling & Industrial Technologies:</p> <p>1.1 Information and Communication Technologies</p> <p>1.3 Advanced Materials</p> <p>1.5 Advanced Manufacturing and Processing</p>	<p>European Green Vehicles Initiative (EGVI)</p> <p>Factories of the Future</p> <p>euRobotics Initiative</p> <p>Sustainable Process Industry through Resource and Energy Efficiency (SPIRE)</p>

FIGURE 3 Potential correspondence to the Specific Programme Horizon 2020 and Public-Private Partnerships

Research and Innovation Roadmaps

The Research and Innovation roadmaps for Affordability & Competitiveness set out the collaborative technological research and pilot/demonstrator topics and their timing, which are priorities for the automotive manufacturers during the course of Horizon 2020 and beyond, in order to meet the defined strategy and milestones.

The following research and innovation areas are the priorities identified for the EUCAR R&I roadmaps in Affordability & Competitiveness:

Materials, technologies and process for interiors

- In scientific research: modularity, new surface functionalisation, visual appearance and haptics
- In technological research:
 - Acoustics
 - Thermal stability
 - Shapeability
 - Process compatibility
 - New architecture
- Integration into the production process and large scale production in pilots and eventual industrialisation

Materials, technologies, process and simulation tools for lightweight vehicle structure

- In scientific research: new alloys and sheets
- In technological research:
 - Glass / composite reinforcement
 - Shapeability
 - Joining technologies
 - Sheet forming
 - Process compatibility
- Integration into the production process and large scale production in pilots and eventual industrialisation

Roadmap : Materials Technologies

People productivity: Collaboration and automation (human with robots)

- Safety
- Surveillance
- Tracking
- Reflexes
- Algorithms
- Testing on moving lines and with human interaction in the factory

People productivity: Ergonomics and automation (including aging workforce)

- Robotic assistance
- Full automation of heavy workstations
- Models and simulation tools
- Workers knowledge management

Roadmap : People Productivity

Energy and resource-efficient plants

- Energy planning
- Renewables use
- Energy recovery

Roadmap : Energy & Resource-Efficient Plants

Virtual engineering & simulation

- Basic research in virtual engineering
- Simulation for manufacturing and ergonomic assessment
- Lightweight vehicle creation
- Simulation and modelling for materials and flexible parts

Roadmap : Virtual Engineering & Simulation