

This fiche is part of the wider roadmap for cross-cutting KETs activities

'Cross-cutting KETs' activities bring together and integrate different KETs and reflect the interdisciplinary nature of technological development. They have the potential to lead to unforeseen advances and new markets, and are important contributors to new technological components or products.

The complete roadmap for cross-cutting KETs activities can be downloaded from:

<http://ec.europa.eu/growth/industry/key-enabling-technologies/eu-actions/rockets>

Potential areas of industrial interest relevant for cross-cutting KETs in the Transport and Mobility domain



This innovation field is part of the wider roadmap for cross-cutting KETs activities developed within the framework of the RO-cKETs study. The roadmap for cross-cutting KETs activities identifies the potential innovation fields of industrial interest relevant for cross-cutting KETs in a broad range of industrial sectors relevant for the European economy.

The roadmap has been developed starting from actual market needs and industrial challenges in a broad range of industrial sectors relevant for the European economy. The roadmapping activity has focused on exploring potential innovation areas in terms of products, processes or services with respect to which the cross-fertilization between KETs can provide an added value, taking into account the main market drivers for each of those innovation areas as well as the societal and economic context in which they locate.

Taking the demand side as a starting point, cross-cutting KETs activities will in general include activities closer to market and applications. The study focused on identifying potential innovation areas of industrial interest implying Technology Readiness Levels of between 4 and 8.

T.2.2: Green fuels

Scope:

To develop cost-effective fuels from biomass and other sustainable resources that demonstrate sufficient energy density and satisfying operational characteristics while being producible at reasonable costs with clean highly energy-efficient processes.

Note: green fuels are addressed here within the “transport” point of view but may be dedicated to other usages (e.g. combustion for energy generation). See also the correlated Innovation Field in the Chemical Processes, Chemicals, Chemical Products and Materials Domain.

Demand-side requirements (stemming from Societal Challenges) addressed:

- Tackle the “Smart, green and integrated transport” societal challenge
- Contribute to the achievement of the EU Transport 2050 strategy (COM/2011/0144 final) objective of a 60% reduction of CO₂ emissions from transports, at least 40% for shipping
- Support the Smart Vehicle initiative of the i2010 strategic framework on the innovation society (COM(2005) 229 final)
- Continuously enhance safety, resistance/resilience and security of vehicle operation all along end-to-end transport chains
- Increase recyclability of vehicles and systems and resource efficiency in the manufacturing processes and reduce dependency to rare or foreign controlled materials and components (as per the Raw Materials Initiative (COM(2008)699) and numerous waste management regulations)

Demand-side requirements (stemming from market needs) addressed:

- Reduce vehicle operation costs, including through increasing energy efficiency and reducing final vehicle energy bill, but also through optimising overall vehicle lifecycle cost of ownership, including maintenance, repair and overhaul
- Reduce or maintain numbers and rates of accidents in Europe at an acceptable number, whatever traffic growth
- Enable new transportation services dealing with changing mobility and transportation needs, changing trade patterns as well as citizen and logistic chains request for affordable, timely, comfortable, seamless and ubiquitous transport services
- Enable time to market reduction and production ramp up / adaptation so as to cope with European and global market requests on new vehicle supply

Specific technical/industrial challenges (mainly resulting from gaps in technological capacities):

- Demonstration of biofuel or other alternative drop-in fuel for vehicle operation, including storage, engine injection, combustion and exhaust capabilities
- Development of holistic approaches of fuels, vehicle powertrain lubricants and all individual components, so as to reduce fuel consumption, pollutant emissions (CO₂, NO_x, SO_x, particles, soot, volatiles, etc.), use of chemicals falling under reach constraints (as hydrazine or xenon for space thrust), need for maintenance and production costs.
- Master characterization, quantification and modelling of non-volatile and volatile particles/pollutants/species from fuel combustion emissions (including chemical kinetics database for alternative fuels) so as to optimize fuel formulation for minimal emissions
- Setup of eco-efficient processes for cost-effective sustainable mass sourcing and production of optimal regulation compliant fuels from all forms of feedstock, including synthetic crude oils from bio sources, liquefied coal or gas, etc.
- Development of the usage of non-hydrocarbon energy sources for vehicles (electricity, hydrogen, compressed gases, sail support, etc.)

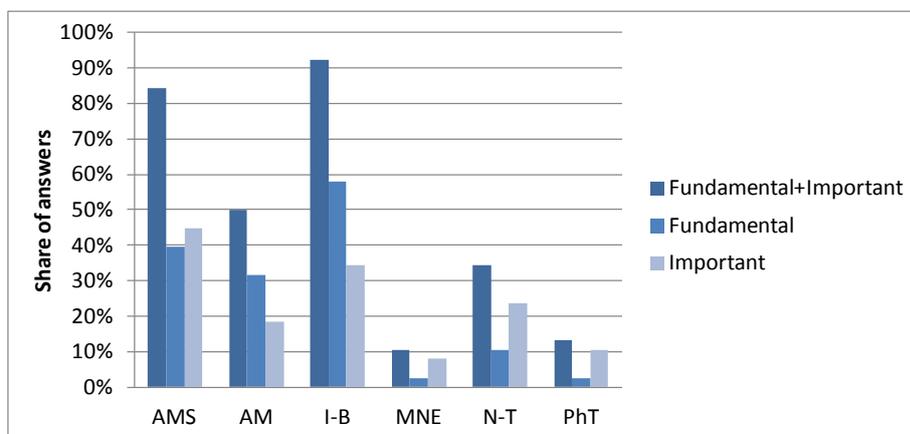
Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development of more advanced biofuels or other alternative drop-in fuels for vehicle operation, which should ensure optimal vehicle

operation and be thus demonstrated as far as storage, engine injection, combustion and exhaust capabilities are concerned.

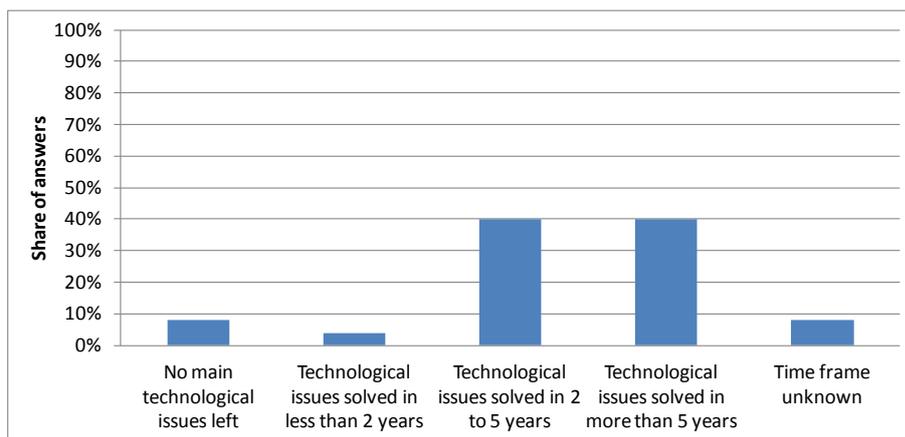
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong interaction of KETs with respect to this Innovation Field, with either fundamental or important contribution mainly by the following KETs:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)
- Industrial Biotechnology (I-B)



Timing for implementation:

According to the majority of KETs experts' opinions (whose result is depicted in the below bar chart), desk research, and in line with the KETs-related patenting activity in this field, it is considered that the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field could be solved in a time frame of either 2 to 5 years or more than 5 years:



Depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, and considering also the strict correlation of this Innovation Field with its counterpart focused on the processes for the cost-efficient conversion of biomass to biofuels (that is addressed within the Chemical Processes, Chemicals, Chemical Products and Materials domain), the provision of support in the short term should be taken into consideration within this framework.

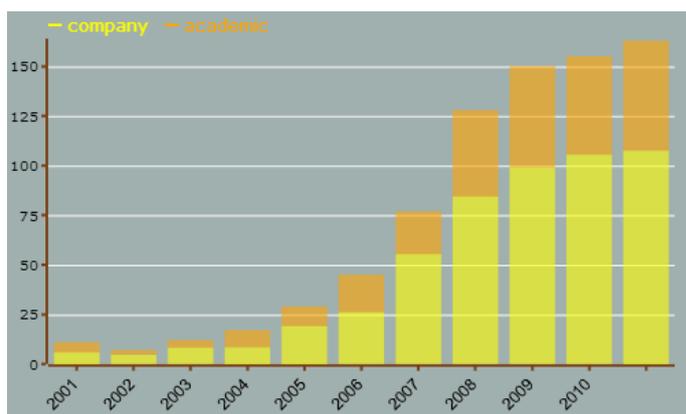
Additional information according to results of assessment:

➤ **Impact assessment:**

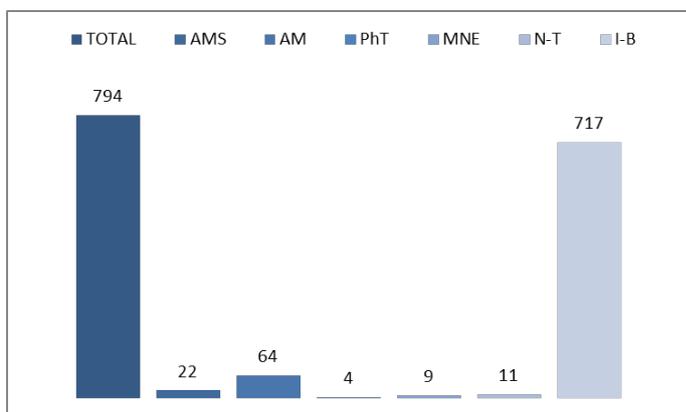
- “The future of EU transport development should be based on alternative, sustainable fuels as an integrated part of a more holistic approach to the transport sector. The Commission has therefore not proposed new targets for the transport sector after 2020 (current targets: 10% renewable energy for the transport sector. The share of renewables in transport rose to 4.7% in 2010 from 1.2% in 2005). Based on the lessons of the existing target and on the assessment of how to minimise indirect land-use change emissions, it is clear that first generation biofuels have a limited role in decarbonising the transport sector. A range of alternative renewable fuels and a mix of targeted policy measures building on the Transport White Paper are thus needed to address the challenges of the transport sector in a 2030 perspective and beyond” (Source: EC Communication on Climate and Energy Policy Framework 2020-2030, January 2014).
- “The main drivers for the production and use of biofuels are the security and diversification of energy supply, reduction of oil imports and dependence on oil, rural development and the reduction of greenhouse gas (GHG) emissions.” (Source: European Union Strategic Energy Technologies Information System (SETIS) website).

➤ **Results of patents scenario analysis:**

- 794 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Increasing trend curve (number of patents per year) with the paradigmatic shape of a technology on the move for reaching technological maturity:



- Patents by KET(s):

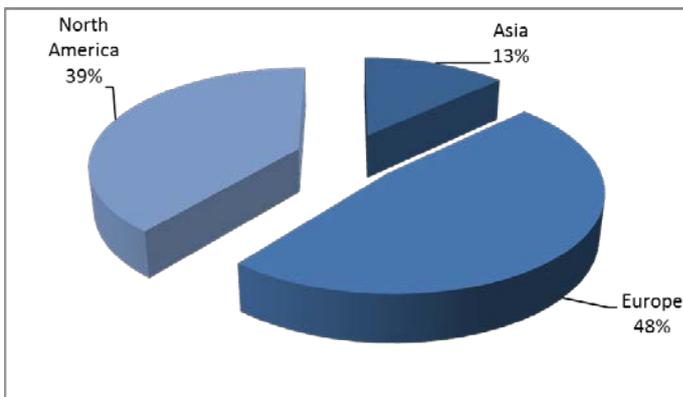


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	Number of patents
AM	64
AM / IBT	16
AM / IBT / N-T	1

<i>KET(s)</i>	<i>Number of patents</i>
AM / N-T	5
AMS	22
AMS / AM	1
AMS / IBT	3
IBT	717
IBT / N-T	4
MNE	9
MNE / N-T	1
MNE / PhT	4
N-T	11
PhT	4
AM	64
AM / IBT	16
AM / IBT / N-T	1
AM / N-T	5
AMS	22

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

