European Commission

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/ro-ckets

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.4.4: Transportation system wide security and threat response

Scope:

To develop security systems with a holistic approach and with no breach all over the vehicle operation and infrastructure, integrating highly reliable and efficient check points for persons and goods designed to take into account the human factor and manage all sources of information in security and privacy, able to support decision-making and respond to all sort of threats, including with non-lethal neutralisation capabilities.

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 CO_2 emissions from transports
- Deliver safer and less congested travel as well as smoother and quicker journeys, as requested for the Trans European Transport Network (TEN-T) policy (Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 and repealing Decision No 661/2010/EU Text with EEA relevance)
- Achieve SESAR 2020 objectives for the European Air Traffic management, as regards environment (emissions and local nuisances), safety and ability to efficiently cope with growing traffic volumes
- Continuously enhance safety and resistance/resilience of vehicle operation all along end-to-end transport chains
- Support the Smart Vehicle initiative of the i2010 strategic framework on the innovation society (COM(2005) 229 final)
- Ensure operational implementation of European international transport agreements (as TRACECA, SEETO and NDPTL)

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

- Reduce traffic management direct (fees for operators) and indirect (such as costs of jams on citizen health, economy competitiveness, environment, etc.) operational costs
- 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, citizen request for affordable, timely, seamless and ubiquitous transport services
- Support integration of lean global logistic chains taking advantage of communication and tracking technologies for preventing incidents and offering in-trip services

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

- Increase of passengers and staff identity authentication capabilities
- Increase of checkpoint throughput with automation and passengers not required to devest
- Increase of large cargo/containers high throughput scanning
- Increase of detection capability whilst maintaining false alarm rate at operationally viable levels
- Development of sensors to detect prohibited articles and all sorts of present and future threats (as CBRN)
- Handling of data from various security related data sources (including capabilities for artificial intelligence, data mining, big data, data fusion and correlation, etc.)
- Guarantee integrity of information, systems and communication in case of any cyber-attack through non-disruptive information Technology (IT) infrastructure resilient to jamming, spoofing and other attacks (including for high volumes of unmanned vehicle operation)
- Introduction of time-efficient, non-repetitive, unpredictable measures in the verification process
- Identification of non-lethal on-board neutralization options for identified threats (cargo, passengers, crew), and regularly update it depending on piracy practices evolutions
- Evaluation of the opportunity to implement active defensive / threat detection measures (sea mine detection, anti-missile systems, etc.) on board civilian transport vehicles
- Optimization of operational systems and decision-making assistance so as to minimize or compensate occurrence of human error

- Equipment of urban areas with tamper-proof / theft-proof high autonomy sensing nodes and radio beacons able to deliver information on traffic, parking space availability, vehicle presence in parking lots and abnormal events
- Ensure trustworthy record, storage, transfer and usage of personal data, so as to prevent new types of attacks, privacy breaching or technology-induced safety risks
- Enable remote control of the vehicle when the crew is incapacitated or otherwise prevented from normally controlling the vehicle

Contribution by cross-cutting Key Enabling Technologies:

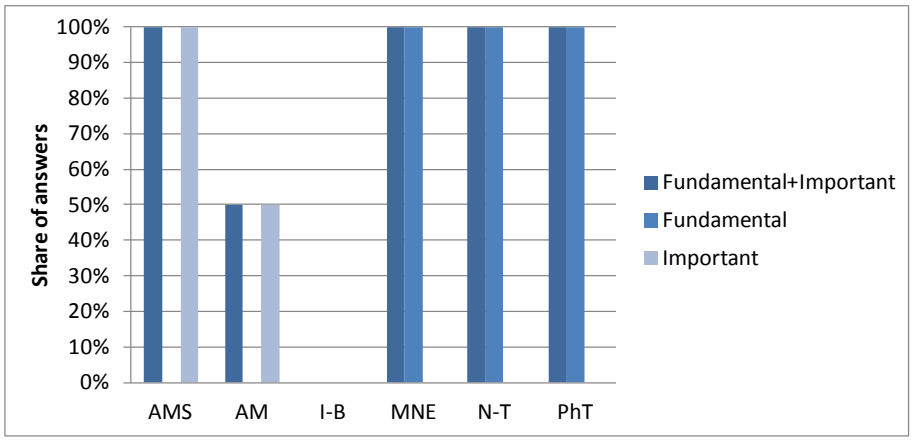
In respect to this Innovation Field, the integration of KETs could contribute to the development of holistic security systems with no breach all over vehicle operation and the infrastructure, thanks to integrating highly reliable and efficient checkpoints for persons and goods (including e.g. passengers and staff, prohibited articles and all sorts of present and future threats) with increased detection capability whilst low rate of false alarms.

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:

- Micro- and Nano-Electronics (MNE)
- Nanotechnologies (N-T)
- Photonics (PhT)

and, to an important extent:

- Advanced Manufacturing Systems (AMS)
- Advanced Materials (AM)



Timing for implementation:

No consensual indication could be retrieved from KETs experts' opinions concerning the time frame required for solving the main technological issues holding back the achievement of cross-cutting KETs based products related to this Innovation Field. However, considering the specific technical and/or industrial challenges and the maturity of technologies in this field, the provision of support in the short term is suggested within this framework.

Additional information according to results of assessment:

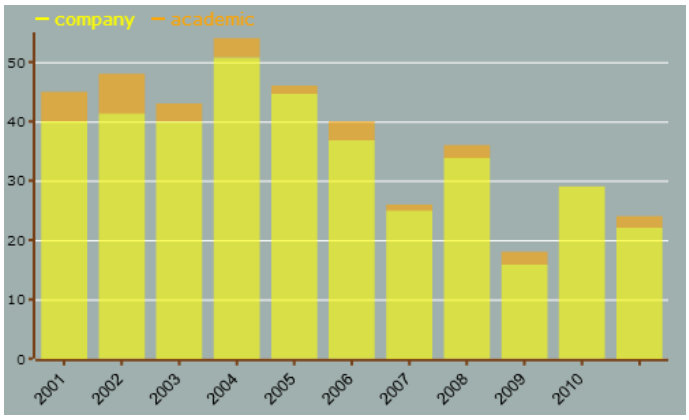
➢ ***Impact assessment:***

- It is well known that the defence sector has long needed to cope with threat and emergency response, particularly in the last years, in order to cope with the most different threats that may arise, from biological to cyber security. This significant knowledge can prove useful to be further explored and implemented into stronger actions for safety and homeland security. This area is particularly related to dual use technologies.

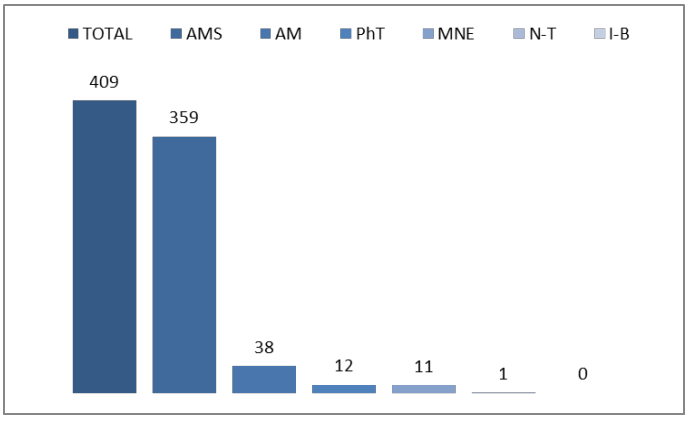
- As demonstrated by 9/11, Madrid or London attacks, transport chains have become a priority target for political terrorism and possibly any other form of malevolent action. Ensuring the protection of the transport systems is therefore a major contributor to the "*Secure societies - protecting freedom and security of Europe and its citizens"* societal challenge.
- Security experts systematically underline the fact that "zero hijack" is not an achievable objective and security is to be seen through the concepts of risk and protective barriers. This is where the holistic approach is engaged, with considering that protection is to be built encompassing the entire transport system, or the risk would agglutinate on the unprotected – the weak – links.
- If security – in the specific case physical security - is a human right and a social necessity, security technologies also have the potential for negative impacts, which are to be minimized. Air transport travel time advantage is notoriously diluted by time lost in transit, including time lost in airport checkpoints. In addition, the omnipresence of security clues has the paradox effect of creating more fears than confidence, feeding socio-political tensions. Developing security means that are highly protective but also smoother, less intrusive and stressful, respectful of privacy and democratic liberties is an absolute necessity for supporting the peaceful deployment of a secure and inclusive European standard society.

➢ ***Results of patents scenario analysis:***

- 409 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Decreasing trend curve (number of patents per year):



- Patents by KET(s):

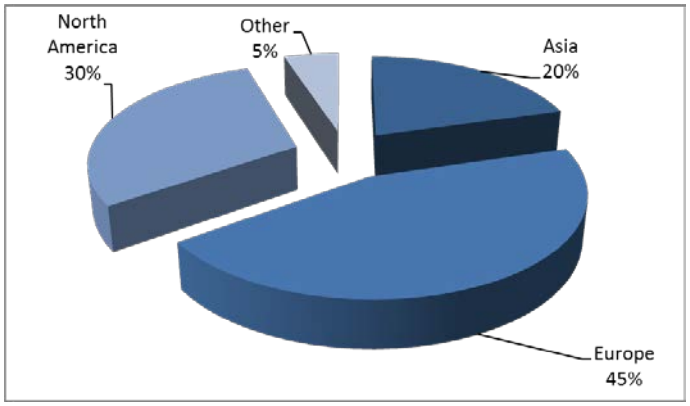


- Patents by KET(s) and relevant combinations of KETs:

KET(s)	*Number of patents*
AM	38
AM / MNE	1
AM / PhT	3
AMS	359

KET(s)	*Number of patents*
AMS / MNE	4
AMS / N-T	1
AMS / PhT	3
MNE	11
N-T	1
PhT	12

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection: