

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 Environment 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.

EV.1.5: Use of waste as a resource enabled by advanced sorting, separation and treatment technologies

Scope:

To provide for an increased use of waste as a resource enabled by advanced sorting technologies capable of recognizing various waste types in a more effective way, advanced separation approaches capable of separating waste into the various recoverable waste streams, and advanced treatment technologies capable of treating the various waste streams, towards a circular economy.

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

- Tackle the “climate action, resource efficiency and raw materials” challenge, indirectly also contributing to addressing challenges such as “food security, sustainable agriculture, marine and maritime research and the bio-economy” and “health, demographic change and wellbeing”

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

- Manage environmental hazards and pollution
- Reduce processing costs through recovery (of both energy and resources) in industrial activities
- Minimize waste thereby reducing related management costs

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

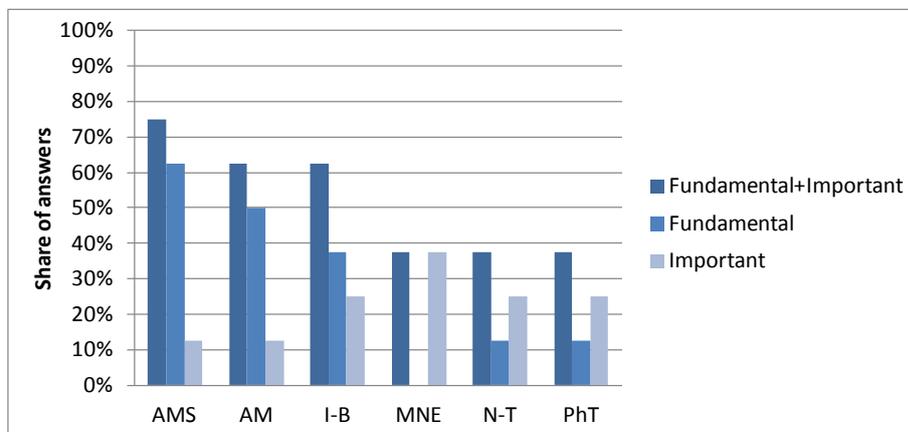
- Development of advanced sorting technologies capable to recognize various waste types in a more effective way
- Development of advanced separation approaches capable to separate waste into the various recoverable waste streams
- Development of advanced treatment technologies capable of treating the various waste streams

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 solutions aimed at an increased use of waste as a resource towards the circular economy, thanks to the development of more advanced sorting, separation and treatment technologies that are able to sort and separate waste more effectively into the various recoverable waste fractions and treat them accordingly toward effective recovery. Among technologies, one should mention sensors, a diverse range of which (based on e.g. optical, X-ray, electromagnetic, conductive, thermal technologies) allows to recognize the various materials within waste streams, as combined with effective separation methods (based on e.g. grasping, ejection using compressed air, etc.) or treatment technologies.

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)
- Photonics (PhT)
- Micro- and Nano-Electronics (MNE)
- Nanotechnologies (N-T)
- Industrial Biotechnology (I-B)



Timing for implementation:

Waste sorting, separation and treatment technologies are actually already widely applied in industrial practice. Although this Innovation Field has been assessed by KETs experts as still entailing some R&D issues that require more than 5 years for being solved (especially referring to advanced sorting technologies), innovation in this field is actually of the incremental type, for which support can in principle be foreseen throughout time. Hence, depending on the specific technical and/or industrial challenges holding back the achievement of cross-cutting KETs based products related to this Innovation Field, the provision of support in the short to medium term should be taken into consideration within this framework.

Additional information according to results of assessment:

➤ **Impact assessment:**

- Waste sorting, separation and treatment technologies are already widely applied in industrial practice, although potentials for improvement through the implementation of more advanced solutions are high.
- One of the key features of companies leading the market is the ability to sort the increasingly diverse range of materials coming through, and deal with them appropriately. TOMRA Sorting Solutions, a global market leader in sensor-based sorting solutions with its headquarters in Norway, provides technology for the recycling, mining and food industries under the product names TITECH, CommodasUltrasort and Odenberg respectively, has long been aware of this issue and has been spearheading technologies which have now been adopted across the industry. The company provides technologies and complete equipment for sorting a huge range of materials, from plastic bottles and WEEE to construction and industrial waste (Source: Waste sorting, A look at the separation and sorting techniques in today's European market, www.waste-management-world.com; Press Release by TOMRA, 2012, www.tomra.com).
- Among technologies, one should mention sensors, a diverse range of which (based on e.g. optical, X-ray, electromagnetic, conductive, thermal technologies) allows to recognize the various materials within waste streams, as combined with effective separation methods (based on e.g. grasping, ejection using compressed air, etc.) and subsequent treatment technologies enabling recovery of the various waste streams.
- As an example, Waste Electrical and Electronic Equipment (WEEE) is currently considered to be one of the fastest growing waste streams in the EU, growing at 3-5% per year. WEEE contains diverse substances that pose considerable environmental and health risks if treated inadequately. On the other hand, the recycling of WEEE offers substantial opportunities in terms of making secondary raw materials available on the market. EU legislation promoting the collection and recycling of such equipment (Directive 2002/96/EC on WEEE) has been in force since February 2003. The legislation provides for the creation of collection schemes where consumers return their used waste equipment free of charge. Yet, separation still largely relies on manual work (Sources: Eurostat, <http://epp.eurostat.ec.europa.eu>).

➤ **Results of patents scenario analysis:**

- No significant patent-related indicators can be reported in this field