

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 Construction 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.

## CS.1.3: Construction materials and components with low lifecycle carbon footprint

### Scope:

To develop cost competitive and high performance construction materials and components with low lifecycle carbon footprint (such as green concrete, concrete using recycled aggregates, etc.).

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

- Tackle the “Climate action, resource efficiency and raw materials” societal challenge as well as the “Secure, clean and efficient energy” societal challenge in the first instance, thanks to lowering the amount of embodied energy in materials used during the construction process and the energy demand during the use-phase of buildings
- Contribute to achieve net zero-energy buildings in the future, serving as driver to boost the market for novel renewable energy applications in the residential sector (according to the Energy Performance of Buildings Directive (2010/31/EU))
- Contribute at the same time to the “Health, demographic change and wellbeing” societal challenge thanks to providing comfortable, well-designed, and energy efficient living spaces for all

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

- Enhance competitiveness of the construction sector
- Optimise the life-cycle cost of the built environment
- Provide comfortable, well-designed, energy efficient living spaces for people
- Reduce energy consumption (resulting in savings over the conventional energy purchase for private end-users and in the overall reduction of the energy demand on a global scale)
- Enhance the urban environment, creating a built environment that is accessible and usable for all
- Improve health, safety and security of the built environment
- Make construction activities more efficient, precise and with greater risk avoidance
- Improve health and safety conditions during construction processes

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

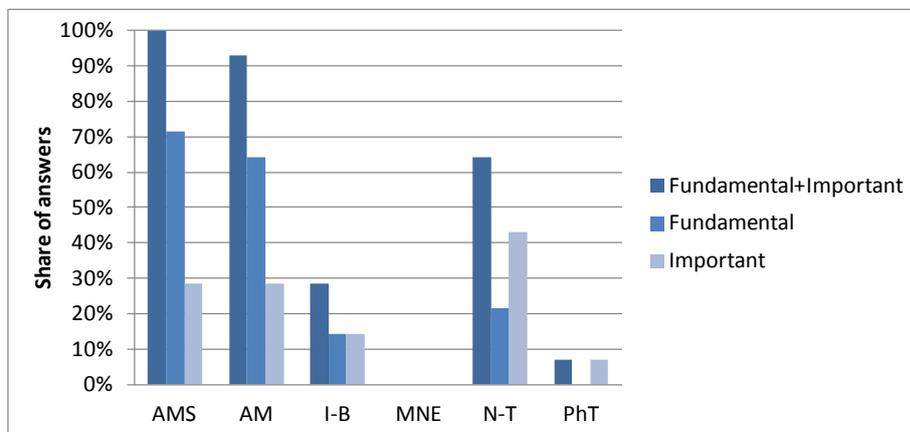
- Demonstration of construction materials and components with low embodied carbon (e.g. green concrete, concrete using recycled aggregates, etc.) ensuring low lifecycle environmental impact
- Development of construction materials and components/elements (incl. prefabricate) containing a high level of recycled materials leading to CO<sub>2</sub> savings, energy savings and higher resource efficiency
- Ensuring of high and predictable durability and low lifecycle environmental impact of construction materials with low embodied carbon (e.g. green concrete, concrete using recycled aggregates, etc.)

### Contribution by cross-cutting Key Enabling Technologies:

In respect to this Innovation Field, the integration of KETs could contribute to the development and subsequent demonstration of solutions such as construction materials and components, including prefabricated ones, with low embodied carbon leading to CO<sub>2</sub> and energy savings, and to a global superior resource efficiency in the sector.

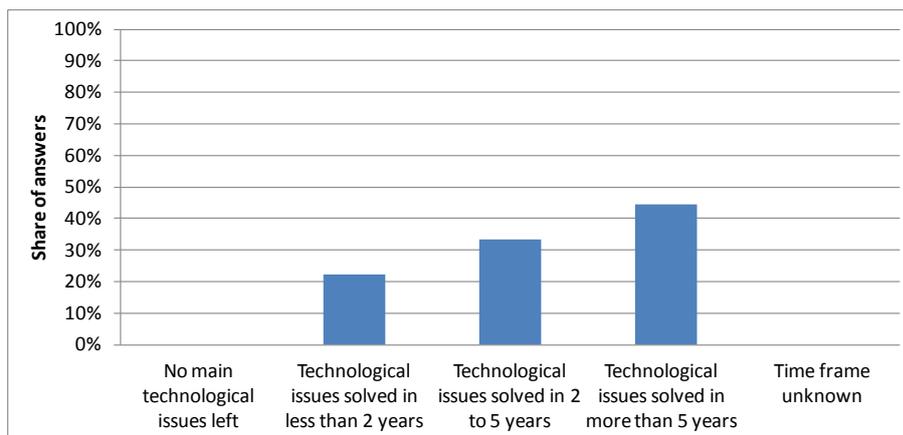
To this aim, the combination of KETs experts' opinions collected through the dedicated survey (whose result is depicted in the below bar chart), the examination of KETs-related patenting activity in respect to this Innovation Field, and desk research activities, have allowed identifying a rather strong 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)
- Nanotechnologies (N-T)
- Industrial Biotechnology (I-B) to a lower extent



### 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 more than 5 years, yet significant consensus by experts indicates also shorter periods being necessary:



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:

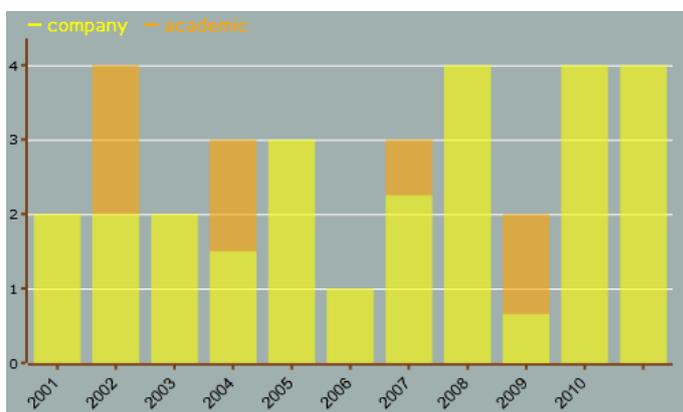
#### ➤ **Impact assessment:**

- According to Eurostat data, construction production for EU28 was valued at 1550 billion Euro in 2011. Within this framework, the residential sector represents some 46% of the total EU production, the non-residential sector 31% and civil engineering 23%.
- Construction production experienced a significant decrease in the last few years mainly resulted from the overall weak economic framework, high unemployment and low consumer confidence that reduced the potential in housing and non-residential construction, whereas public consolidation measures dampened civil engineering. Nonetheless, according to Euroconstruct, a positive trend is foreseen for the next 4 years. According to the Euroconstruct's outlook, during the course of the overall economic upswing, construction is expected to grow moderately by 0.9% in 2014, whereas a further more dynamic performance should follow in the forecast period 2015-2016, given a stable economic framework. Euroconstruct also foresees expansion in volume in all sectors (i.e. housing, non-residential construction and civil engineering), though such expansion has to cope with the fact that the growth path starts from low volumes of the previous years. Also as regards public works, necessary and often delayed infrastructure measures and investments will counter the public consolidation pressure.

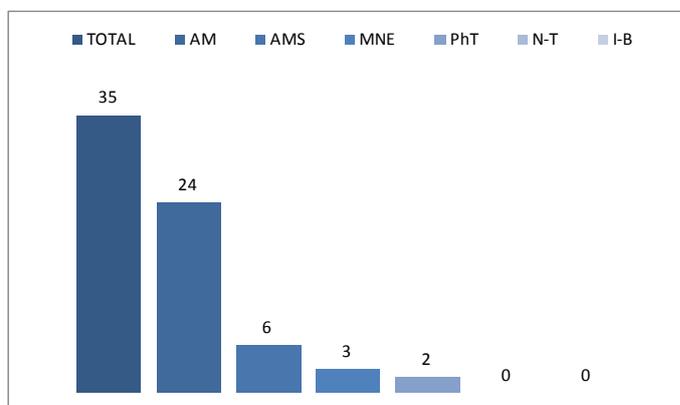
- Within this overall picture, driven by the need to perform more environmentally-friendly, the building and construction sector, which is a major consumer of both energy and resources, is moving toward the use of greener materials and methods. Environmentally-sustainable features are increasingly viewed by both buildings' and structures' owners and developers as a fundamental element, and attention to green building materials as well as to more sustainable construction methods is already considered a core competency, which is expected to grow in importance in the next future as the economy as a whole and the construction activity recover.
- As environmental consciousness increases in the building and construction sector, green building standards and certifications are consequently also gaining in importance. There are several awarding programmes for certifying "green" buildings in Europe, the four most common which have gained importance are the LEED, BREEAM, DGNB, and HQE. Among these programmes, mainly certifying the energy performance of buildings, LEED also awards for the use of green building materials and the sustainable use of resources.
- These argumentations, along with the need for energy intensive building and construction materials producing industries such as, among others, the cement and bricks producing industries to reduce the carbon footprint of their products, are at the basis of an increased interest toward cost competitive and high performance construction materials and components with low lifecycle carbon footprint (such as green concrete, concrete using recycled aggregates, etc.).
- Source: Euroconstruct's outlook, 76th EUROCONSTRUCT Conference, Prague, 2013

➤ **Results of patents scenario analysis:**

- 32 exclusively KETs-related patents identified in the period 2001-2011 for the specific Innovation Field
- Stable trend curve (number of patents per year)
- Highest share of industrial applicants:



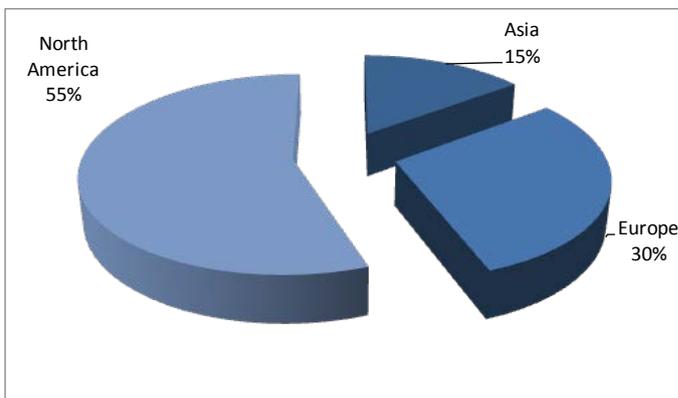
- Patents by KET(s):



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

<i>KET(s)</i>	<i>Number of patents</i>
AM	24
AMS	6
AMS / AM	1
MNE	3
MNE / PhT	2
PhT	2

- Patent distribution by (Applicant) organization geographical zone:



- Patent distribution by geographical zone of priority protection:

