
NANOfutures, the European Technology Integrating and Innovation Platform: Nanotechnologies—Essential Part of Sustainable Development

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Abstract

The European Commission has identified six Key Enabling Technologies (KETs), including nanotechnology and micro and nanoelectronics, as a key priority of the new R&I Programme Horizon 2020 for the smart, sustainable and inclusive development of European growth. Moreover, it is well known that nanotechnologies contribute to scientific and technical progress across disciplines and sectors, with potential to help overcoming the big challenges that our society is facing. Within this framework, NANOfutures, the European Integrating Technology and Innovation Platform on nanotechnology, was created to accelerate the safe and responsible uptake and use of nanotechnology.

Keywords

Key enabling technologies · Nanotechnologies · Sustainable development · Cross-ETP · Nanofutures

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1 Introduction

The European Commission has identified six Key Enabling Technologies (KETs) (High-Level Expert Group 2011), including nanotechnology (HLG KET working document 2010), and micro and nanoelectronics (Interim Thematic Report 2010), as a key priority of the new European Framework Programme for Research and Innovation (R&I) Horizon (2020) (www.ec.europa.eu/programmes/horizon2020/h2020-sections). KETs' deployment is crucial for the further development of the European economy and for strengthening Europe's capacity for industrial innovation (High-Level Expert Group on Key Enabling Technologies). Applications of KETs are considered to directly or indirectly stimulate competitiveness and generate jobs, indispensable for sustainable and inclusive European growth.

Regarding nanotechnology, it is well known that it contributes to scientific and technical progress across disciplines and sectors, with potential to help overcoming the big challenges that our society is facing. Nanotechnology-based innovation, however, calls for a horizontal approach that includes cross-sectorial strategic needs and broader socio-economic challenges going beyond technological gaps, if its development, application, and commercialisation are to be accomplished.

Within this framework *NANO*future*s*, the European Integrating Technology and Innovation Platform on nanotechnology (www.nanofutures.eu) started its activities in 2009. It intends to address all these issues and to coordinate the different ongoing activities and projects at European, national and local level to reduce fragmentation and dispersion of efforts. Moreover, it aims to be a long-lasting hub connecting all the relevant nanotechnology related stakeholders. *NANO*future*s* has a very novel approach as it has been created as an integrating platform very much focused on innovation and impact. Currently, it integrates more than 850 members representing industry, science, and society from EU and beyond.

2 *NANO*future*s*: A Cross-European Technology Platform

In order to properly meet the great nanotechnology challenges of today, several issues need to be addressed, including cross-sectorial strategic needs, broader socioeconomic challenges going beyond technological gaps, which hinder the nanotechnology development and commercialisation. Although other already ongoing European technology platforms have been capable of addressing the specific needs and challenges of their sector or technology areas effectively, covering such broader challenges requires an unusual multidisciplinary and cross-sectorial collaboration within the value and innovation chains. Within this frame, *NANO*future*s* (www.nanofutures.eu) has been created in 2009 to help improve the situation and accelerate the safe and responsible uptake and use of nanotechnology. Recently, it was officially recognised as a Cross-European Technology Platform (ETP) Initiative by the European Commission (EC) in the context of the upcoming "Strategy for European Technology Platforms: ETP 2020" (2013). Within this strategy, the

- Skills and Education
- Networking
- Communication
- Research and Technology

With this structure it is able to connect and establish cooperation of all stakeholders that require nanotechnologies in their sector, and/or product. In this sense, NANO*utures* platform is instrumental in the industrialisation of nanotechnology by bridging the gap between research, technological innovation and company/market innovation aspects and carries nanotechnology industrialization forward to the benefit of European economy and its citizens. Thus, Platform structure and aims contribute to the Europe 2020 strategy growth drivers in the following manners:

- Smart: *fostering new market-oriented knowledge, boosting innovation narrowing the market science gap, adjusting nano education to industrial/society needs,*
- Sustainable: *helping to create more sustainable and efficient products/services/manufacturing process based on/for nano*
- Inclusive: *helping to generate skilled and high-quality jobs.*

NANO*utures* includes geographical coverage, analysis and experimentation that lead to recommendations for common models, protocols, guidelines, structures, mechanisms, policies and processes for use in all the Member States. It also includes raising awareness of EU-wide actions and change, sharing of lessons learned and their feed into European debate and policy making. NANO*utures* is designed by looking beyond the confines of nanotechnology to find a broader European relevance to other important issues, such as societal challenges and communication with society at large.

The crucial added value of NANO*utures* is its capacity to avoid duplication of work, learning from each other and having access to experts from all over Europe translating into a critical mass capable of increasing the valorisation of research in the public and private domains, and a real force to integrate all the concerned stakeholders within a common platform. NANO*utures* platform goes beyond the spheres of pure ‘additionality’, ‘subsidiarity’ or ‘complementarity’ rationales; it is also an adequate EU wide ‘integration’ tool.

3 Nanotechnology in H2020

Nanotechnology has important implications for most, if not all industrial sectors. Thus, the use of nanotechnology is accelerating. Its deployment is a major driver for the trend to improve existing products by creating smaller components and more functional performance materials. It enables the realisation of smaller, quicker, novel functionalities and properties improving existing products and applications or

developing new market innovations. This is especially important due to the potential impact of nanotechnology on established industries and markets by introducing technological innovations to economically important sectors with an orientation towards “value-added” value chains.

Deployment of nanotechnology is a key factor for Europe to strengthen its manufacturing capacities while addressing societal challenges, through a rejuvenation of manufacturing technologies, processes and products as well as through creation of new businesses. The required ingredients are in place as Europe has a solid basic research that assures a well-developed science landscape, and a good industrial base for exploitation of the technology. In this sense, if effective alignment of private and public efforts over promising areas is guaranteed from short to long term, the European nanotechnology is expected to give an outstanding contribution to major grand challenges of our time. The European Commission has included nanotechnology as a theme in its research funding programmes over the past decade and has supported nano-scientists through the European Research Council (ERC). Within the new H2020 Programme, the existing research will be capitalised and the technology transfer addressed in order to move to a new phase where Europe’s intellectual capital is turned into commercial technologies (Nanotechnology: the invisible giant tackling Europe’s future challenges 2013).

The HLG KET report on nanotechnology (HLG KET working document) points out that according to some studies nanotechnology impacted US\$254 billion worth of products in 2009. This impact is predicted to grow to perhaps US\$2.5 trillion by 2015. According to BCC Research 2012 (Nanotechnology: A Realistic Market Assessment) the global market for nanotechnology was valued at nearly \$20.1 billion in 2011. Total sales are expected to reach \$48.9 billion in 2017 after increasing at a five-year compound annual growth rate (CAGR) of 18.7 %. Specifically nanomaterials are expected to have sales worth \$37.3 billion in 2017, a CAGR of 18.6 %, while Nanotools should total \$11.4 billion in 2017, a CAGR of 19.1 %. Moreover, nanotechnology offers a huge potential to impact employment and to provide solutions for major societal challenges. In this context, it is a major contributor to keep employment figures at high level in sectors, in which the EU is among global leaders. In this sense, it is estimated that by 2015 about 2 million nanotechnology workers will be needed worldwide, 0.3–0.4 million within Europe.

Within this framework, NANO*utures* published a roadmap in 2012 (Integrated Research and Industrial Roadmap for European Nanotechnology 2012) for the European nanotechnology [industry?] that focuses on several market-driven value chains (VCs), where both technological and non-technological actions are included to be able to address societal challenges (see Fig. 2). Moreover, cross-cutting actions, relevant for all VCs are also added.

A detailed implementation plan, focusing on action at short to medium terms (up to 2020) is provided, but a brief description of long-term actions is also provided. The vision behind the roadmap is in line with the Horizon 2020 strategy and takes into account actions for:

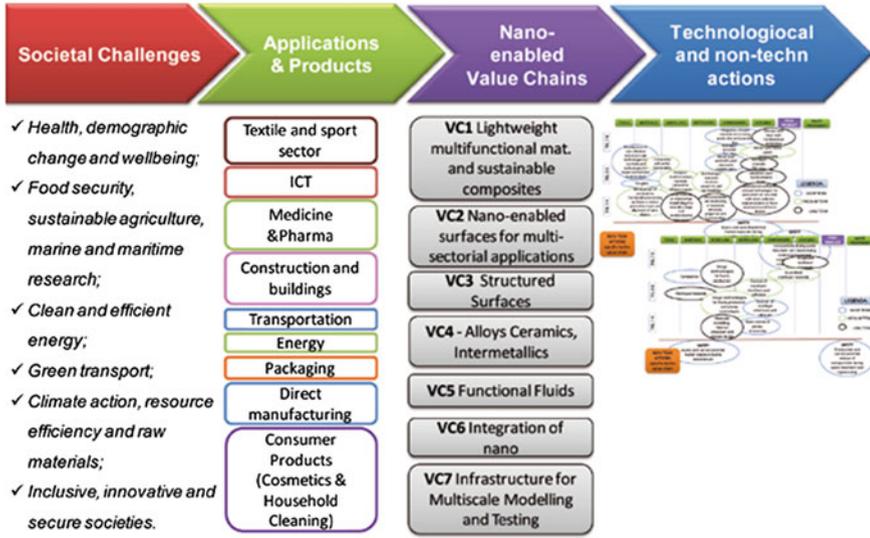


Fig. 2 From societal challenges to markets and products towards NANOfutures roadmap actions (Source Integrated Research and Industrial Roadmap for European Nanotechnology 2012)

- Excellence Science: the first steps of the VCs
- Societal Challenges: a broad view on the non-technological issues
- Industrial Leadership: a market-driven perspective for the development of successful and sustainable nanotechnology.

Implementation of these actions, together with coordination of policies, clustering efforts and supporting cross-collaborations will assure that a more favourable framework and effective commercialisation of nano-enabled products is created.

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