



Nanotechnology is a complex and rapidly changing field, which is often difficult to assess in terms of opportunities, challenges and risks. The observatoryNANO project is funded by the EC for 4 years under FP7 to address this. It is assessing all aspects of the value chain from basic research to market applications in terms of scientific, technological and socio-economic developments and prospects. At the same time it is assessing ethical and societal aspects; potential environment, health and safety issues; and developments in regulations and standards. The project employs a combination of literature review; trend analysis of patents and peer-reviewed publications; and engagement with experts from different fields through interviews, workshops, and questionnaires.

### Summary of Project Objectives

- to observe nanotechnology developments in ten broad sectors: aerospace, automotive, and transport; agrifood; chemistry and materials; construction; energy; environment; health, medicine, and nanobio; ICT; security; and textiles.
- to engage with the expert communities to discuss and review scientific and technical developments, and relate these to socio-economic impacts and wider issues.
- to consolidate this analysis to produce an online database of concise reports, which clearly identify developments, opportunities, challenges and risks in each of these sectors.
- to provide information and tools for the scientific and business communities to support the responsible development of nanotechnologies.
- to support policy and decision makers by providing validated information on the current and forecasted state of nanotechnology development.

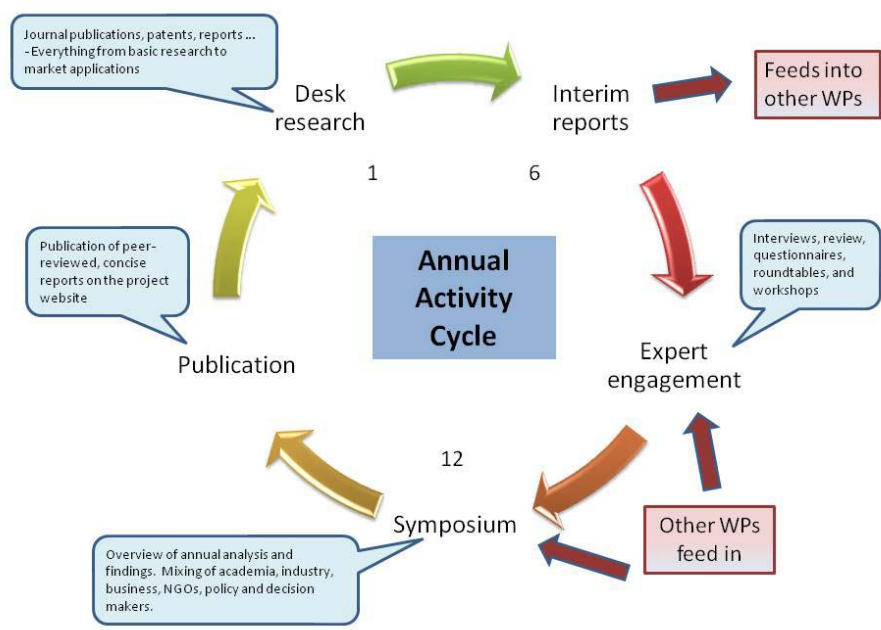
The observatoryNANO combines analysis of different aspects of nanotechnology development into concise reports to support policy and decision makers:



All information from the project is freely available through a dedicated website ([www.observatory-nano.eu](http://www.observatory-nano.eu)). Users can search for specific topics or browse through the catalogue of reports and articles, and select items in an online 'briefcase' to store for easier access later or to download/print as required.



The main output from the project are reports that describe scientific and technical developments, how these can affect society (through new materials, products and services), what the impact might be on the economy, including commercialisation and job creation. These are produced through the following annual cycle:



In the first year of the project a total of 61 reports have been published describing scientific and technical advances in the ten technology sectors:

**Aerospace, Automotive & Transport-** Technologies to produce bulk nanostructured metals; Technologies to produce polymer nanocomposites; Technologies to produce and apply tribological nano-coatings

**Agrifood-** Agricultural production; Food processing and functional food; Food packaging and distribution

**Chemistry & Materials-** Carbon based nanomaterials; Nanocomposites; Nanostructured metals and alloys; Nanopolymers; Nano-ceramics; Nano-fabrication technologies

**Construction-** Cement based materials; Coatings; Living comfort and building safety; Sustainability and environment; Civil- and underground construction

**Energy-** Photovoltaic; Thermoelectricity; Fossil fuel; Energy harvesting; Nuclear; Renewable energies; Fuel cells; Hydrogen production and storage; Batteries and supercapacitors

**Environment-** Air purification; Wastewater purification; Drinking water treatment; Groundwater remediation; Soil remediation

**Health, Medicine & Nanobio-** Cosmetics; Diagnostics; Novel bionanostructures; Implants, surgery and coatings; Therapeutics; Regenerative medicine

**Information & Communication-** Integrated circuits; Memory; Displays; Manufacturing; Photonics; Beyond CMOS

**Security-** Chemical Weapons and Industrial Toxins Detection; Biological Threat Agent Detection; Radiological-Nuclear Weapon Detection; Explosives Detection; Narcotics Detection; Neutralising CBRNE effect; Decontamination; Forensics; Personnel Protection; Equipment and Infrastructure Protection; Condition Monitoring of civilian zones; Anti-counterfeiting; Authentication; Positioning and Localisation

**Textiles-** Nanostructures; Fibre production; Finishing treatments; Textile products

In addition, reports on economic and market developments have been published:

**Aerospace, Automotive & Transport-** Structural parts/airframe; External panels/surfaces; Powertrain; Engine (ICE)/turbines

**Agrifood-** Nanocomposite packaging; Coatings for packaging; Edible coatings; Biodegradable nanocomposites for packaging; Delivery systems for nutraceuticals

**Chemistry & Materials-** Nanomagnetic materials; Carbon nanotubes; Nanodiamond; Intrinsic conducting polymers

**Construction-** Cement based materials; Construction ceramics; Paints; Windows; Insulation systems/materials

**Energy-** Photovoltaic; Fossil fuel

**Environment-** Water treatment; Soil remediation

**Health, Medicine & Nanobio-** Bone replacement materials; Dental nanomaterials; in vivo imaging; Drug delivery

**Information & Communication-** Memory; Displays; Materials

**Security-** Detection

**Textiles-** Water repellent/self-cleaning; Moisture absorption/wicking; Anti-static; Anti-bacteria; Filtration and UV protection

This work is further supported by a broad patent and peer-reviewed publication analysis, showing trends in each of the sectors. The publication analysis draws on a database of 544,440 records of nanoscience and nanotechnology (N&N) publications in peer-reviewed journals between 1998 and 2007, which were identified using published algorithms, to observe: trends in publications over the ten year period, and trends in each of the ten technology sectors (using sets of keywords developed from other relevant databases, journals, thesauri, and professional associations). Output includes country, institute, and co-authorship data. Patent analysis was performed in collaboration with the European Patent Office, making use of the 'Worldwide Patent Statistical database' (PATSTAT) which includes data from 76 patent authorities (national patent offices and the super national authorities of the EPO and the World Intellectual Property Organization (WIPO)). Over 130,000 entries are relevant to nanotechnology. The output from this analysis shows trends in total nanotechnology patenting per year and per country, as well as trends in the ten different technology sectors (using either sets of keywords, or the EPO's existing categorisation).

The consortium is monitoring both the ethical and societal impact of N&N and the impact that societal developments and ethical reflection can have on N&N developments. This work looks at N&N development in four areas: individual and collective responsibility; nanobiomedical ethics; ICT; communication between scientists, technology, and society. It reviews both the findings from the observatoryNANO, and published work by other projects and organisations (including work on codes of conduct). In addition, the partners interview opinion leaders on different aspects of N&N development and are developing a toolkit for ethical reflection and communication (to allow scientists to think about the larger societal and ethical implications of their research, and how this impacts different sections of the community).

Developments in Environment, Health and Safety (EHS) research related to N&N are being assessed, through the review of output from relevant sources (reports and publications from other organisations and projects), and the establishment of liaisons with such organisations. This work also aims to highlight any EHS issues related to the scientific and technological developments identified within WP2 that are not already the subject of external review. In the first year a report describing seminal research in EHS related to N&N has been published.

Work in regulatory and standards agencies is being reviewed to identify developments that will impact EU industry. An annual report describes changes in hard and soft regulation, and standards, and provides contact information for each of these agencies.

The long-term goal of the project consortium is to establish a permanent European Observatory on Nanotechnologies. To do so it has reviewed the funding models and ethos of other similar initiatives, and established an advisory board of international experts and policy makers who can assist the consortium in developing its vision.

Finally, the project aims to communicate its finding through a website and regular dissemination activities (quarterly newsletter, presentations at conferences). In addition it is supporting business development through the provision of corporate social responsibility (CSR) tools (such as the NanoMeter). These will be published during the second year of the project.

## **About the project consortium**

The ObservatoryNANO project is led by the Institute of Nanotechnology (IoN) (UK), and includes: VDI Technologiezentrum (DE), Commissariat à l'énergie atomique (CEA) (FR), Institute of Occupational Medicine (IOM) (UK), Malsch TechnoValuation (MTV) (NL), triple innova (DE), Spinverse (FI), Bax and Willems Consulting Venturing (B&W) (ES), Dutch National Institute for Public Health and the Environment (RIVM) (NL), Technical University of Darmstadt (TUD) (DE), Associazione Italiana per la Ricerca Industriale (AIRI) (IT), Nano and Micro Technology Consulting (NMTC) (DE), Swiss Federal Laboratories for Materials Testing and Research (EMPA) (CH), University of Aarhus (DK), MERIT - Universiteit Maastricht (NL), Technology Centre AS CR (CR).

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