



Safe Nanotechnology EU Industrial Research

Georgios Katalagarianakis
EC, Research DG
Industrial Technologies Directorate
G4 Nanoscience - Nanotechnology



Athens, 26/2/2010



EUROPEAN
COMMISSION

Community research

summary

- **The EU project portfolio and RTD investment**
- **The problem**
- **The next steps**
- **RTD policy making**

Athens, 26/2/2010





EUROPEAN
COMMISSION

Community research

The EU research

- **Lisbon strategy for growth and Jobs...**
- **FP7 - the 7th Framework Programme for Research of the EU (2007 – 2013)**
"Building the Europe of knowledge"
- **NMP - Theme 4 "Nanosciences, nanotechnologies, Materials, and new Production technologies"**
 - **Industrial research programme**



EUROPEAN
COMMISSION

Community research

NMP aims at Industrial Transformation

**In the globalised economy,
EU industry should focus on creating products
with more added-value**

especially by moving from:

- Individual to system competitiveness
- Resource-based to knowledge-based economies
- Macro → micro → nano
- Mono-disciplinarity → interdisciplinarity → convergence

Nanotechnology action plan 2005-2009





EUROPEAN
COMMISSION

Community research



FP6 - NMP PROJECTS

- **ON SAFETY OF NANOPARTICLES:**

- **CELLNANOTOX:** Cellular Interaction and Toxicology with Engineered Nanoparticles
- **DIPNA:** Development of an Integrated Platform for Nanoparticle Analysis to verify their possible toxicity and eco-toxicity
- **NANOINTERACT:** Development of a platform and toolkit for understanding interactions between nanoparticles and the living world
- **NANOSH:** Inflammatory and genotoxic effects of engineered nanomaterials
- **NANOCAP:** Nanotechnology Capacity Building NGOs (FP6-SOCIETY)
- **IMPART:** Improving the understanding of the impact of nanoparticles on human health and the environment
- **PARTICLE-RISK:** Risk Assessment of Exposure to Particles (FP6-NEST)

- **SAFETY OF PROCESSES**

- **NANOSAFE2:** Safe production and use of nanomaterials
- **SAPHIR:** Controlled Production Of High Tech Multifunctional Products And Their Recycling

- **STANDARDISATION AND METROLOGY:**

- **NANO-STRAND:** Standardization related to Research and Development for Nanotechnologies
- **NANOTRANSPORT:** The Behaviour of Aerosols Released to Ambient Air from Nanoparticle Manufacturing - A Pre-normative Study





Impact on Health and the Environment FP7-NMP, 1st year, 2007, topics

<p>NMP-2007-1.3-1 Large RTD Projects</p>	<p>Specific, easy-to-use portable devices for measurement and analysis NANODEVICE: Novel Concepts, Methods, and Technologies for the Production of Portable, Easy-to-Use Devices for the Measurement and Analysis of Airborne Engineered Nanoparticles in Workplace Air</p>
<p>NMP-2007-1.3-2 Small RTD projects</p>	<p>Risk assessment of engineered nanoparticles on health and the environment NANOMMUNE: Comprehensive assessment of hazardous effects of engineered nanomaterials on the immune system NANORETOX: The Reactivity and Toxicity of Engineered Nanoparticles: Risks to the Environment and Human Health NEURONANO: Do nanoparticles induce neurodegenerative diseases? Understanding the origin of reactive oxidative species and protein aggregation and mis-folding phenomena in the presence of nanoparticles</p>
<p>NMP-2007-1.3-3 Coordination</p>	<p>Scientific review on the data and studies on the potential impact on health, safety and the environment of engineered nanoparticles ENRHES: Engineered Nanoparticles: Review of Health and Environmental Safety</p>
<p>NMP-2007-1.3-4 Coordination</p>	<p>Creation of a critical and commented database on the health, safety and environmental impact of nanoparticles NHECD</p>
<p>NMP-2007-1.3-5 Coordination</p>	<p>Coordination in studying the environmental, safety and health impact of engineered nanoparticles and nanotechnology based materials and products NANOIMPACTNET: The European Network on the Health and Environmental Impact of Nanomaterials</p>
<p>HEALTH-2007-1.3-4 Small RTD projects</p>	<p>Alternative testing strategies for the assessment of the toxicological profile of nanoparticles used in medical diagnostics NANOTEST: Development of methodology for alternative testing strategies for the assessment of the toxicological profile of nanoparticles used in medical diagnostics</p>



EUROPEAN
COMMISSION

Community research

Impact on Health and the Environment FP7-NMP: Topics addressed in 2008

<p>NMP-2008-1.3-1 Large RTD Projects</p>	<p>Validation, adaptation and/or development of risk assessment methodology for engineered nano-particles No proposals selected</p>
<p>NMP-2008-1.3-2 Small RTD projects</p>	<p>Impact of engineered nanoparticles on health and the environment</p> <p>ENNSATOX: Engineered Nanoparticle Impact on Aquatic Environments: Structure, Activity and Toxicology ENPRA: Risk Assessment Of Engineered Nanoparticles HINAMOX: Health Impact of Engineered Metal and Metal Oxide Nanoparticles: Response, Bioimaging and Distribution at Cellular and Body Level INLIVETOX: Intestinal, Liver and Endothelial Nanoparticle Toxicity Development and evaluation of a novel tool for high-throughput data generation NEPHH: Nanomaterials Related Environmental Pollution And Health Hazards Throughout Their Life Cycle</p>



Impact on Health and the Environment FP7-NMP: Topics addressed in 2009 Submissions deadline 31/3/2009

<p>NMP-2008-1.3-1 Small RTD projects</p>	<p>Activities towards the development of appropriate solutions for the use, recycling and/or final treatment of nanotechnology-based products (Joint call with Theme 6: 'Environment - Climate Change')</p> <p>Four proposals selected for negotiation:</p> <p>NANOPOLYTOX: Toxicological impact of nanomaterials derived from processing, weathering and recycling of polymer nanocomposites used in various industrial applications</p> <p>NANOHOUSE: Life Cycle of Nanoparticle-based Products used in House Coating</p> <p>NanoFATE: Nanoparticle Fate Assessment and Toxicity in the Environment</p> <p>NanoSustain: Development of sustainable solutions for nanotechnology-based products based on hazard characterization and LCA</p>
<p>NMP-2008-1.3-2 Coordination</p>	<p>Exposure scenaria to nanoparticles</p> <p>NANEX: Development of Exposure Scenarios, for Manufactured Nanomaterials</p>
<p>KBBE-2009-2-4-1 Small RTD projects</p>	<p>Analytical tools for characterisation of nano-particles in the food Matrix</p> <p>NanoLyse: Nanoparticles in food: analytical methods for detection and characterisation</p>





EUROPEAN
COMMISSION

Community research

EU RTD investment

- **FP 6: About € 25 million**
- **FP7, 1st year: About € 25 million**
- **FP7, 2nd year: € 13.75 million**
- **FP7, 3rd year: Estimated after negotiation € 11 million**

- **Total: € 75 million EU funding**



EUROPEAN
COMMISSION

Community research

The challenges for Nano

- Next technological revolution
- Massive investment
- New materials, properties, products
- Huge impact for medicine, energy, water, food, etc.
- But ...

New potential risks to manage



Nano-Risk Management System elements

■ Risk assessment

1. Develop models for predicting potential impact of nanomaterials
2. Develop and validate methods to evaluate toxicity

• Risk monitoring

1. Instruments for assessing exposure to nanomaterials in air and water (number, surface area, mass)
2. Monitoring accidental hazards

Risk understanding / risk evaluation

- Acceptable/unacceptable risks,
- Exposure limits
- Impact evaluation over entire life cycle

Risk Communication

- Dialog and transparency

Risk mitigation

- Proactive risk management
- Safe processes and safe handling

Priority: Develop strategic programmes that enable risk-focussed research





EUROPEAN
COMMISSION

Community research

Problem dimensions

- **Emerging**
- **Global**
- **Crucial**
- **Several industrial sectors involved**
- **Unclear framework in standards, experience, inspection, ...**
- **Generic legislation exists**



EUROPEAN
COMMISSION

Community research

Knowledge gaps

- **Background level**
- **Measurement methods**
- **Metrics**
- **Biological impact**
- **Exposure data**
- **Risk assessment underpinning data**
- ...

Knowledge gaps not necessarily RTD related





EUROPEAN
COMMISSION

Community research

Organisational gaps

- No global strategy, good intentions
- Many funding sources, coordination needed
- Many research projects, plethora of results
- Unpublished or proprietary data
- Data comparison and verification
- Focus on nanoparticles toxicity and ecotoxicity, not (adequately) on process/product safety
- Specific legislation
- Standardisation





EUROPEAN
COMMISSION

Community research

The future priorities

Technical areas in risk management:

- Detection, measurement, marking
- Characterisation
- Exposure control
- Safe processes in production and use
- Safe handling and transport
- Equipment
- Hazard identification and risk assessment, Life Cycle Impact





EU RTD policy bodies in Nano

- **High Level Experts Group of MS and FP7-AS**
 - Established in February 2009
 - Safety chosen as priority area
- **NANOFUTURES technology platform**
 - A research stakeholders forum
 - Synergy across other technology platforms (Suschem, nanomedicine, manufuture, construction, ...)
 - Work done in ETP Industrial Safety, and other groups (nanosafe, nanocare, ...)
- **The nanosafety cluster**
- **An industrial group on safety**
 - Established in June 2009





Discussion points

- **How to manage industrial safety in the nano-industry?**
 - Safety at work; occupational diseases
 - Environmental safety; secondary exposure
 - Consumer safety; product safety
 - **Can RTD and legislation go hand in hand?**
 - **Can RTD needs be anticipated/planned?**
 - **How to address EU-MS authorities, industry collaboration**
 - **How to join efforts**

- **EU RTD is breakthrough-innovation oriented; it cannot be used for routine work but can establish foundations**
 - Data collection, management, RA, LCA, Standardisation
 - Market surveillance, certification

- **OECD Working Party on Manufactured Nanomaterials**
 - Sponsorship programme

- **A mechanism to map and control progress?**





The next steps in RTD

- **A projects cluster on Nano-Safety**
 - Established in February 2009, about 30 projects
 - Open participation, next meeting: Lausanne, March 2010
 - Synergy, projects mapping, data, test protocols, results verification and validation, material characterisation, research roadmapping
 - Mainly nano-toxicity, progress in exposure, RA, LCA
- **Infrastructure/competences integration** (proposal submitted)
- **Modelling/simulation** (NMP call closed, jointly with USA)
- **Risk management** (NMP call closed)
- **ERANET** (proposal submitted)
- **Joint Programming**
- **Risk monitoring**
- **Risk reduction**
- **International cooperation**
- **RTD support to Standardisation**





priority topics discussion

- Rationale:
- Based on what is needed by 2016. 6 topics to be proposed up to 2013 – 2 per year
- Topics should have sufficient scope as to be meaningful, without being too large (focus will be on large projects).
- Complementary to the existing ~30 projects (FP6 and FP7) in the cluster (€75M funding) and the expected (€25M)
- Considering needs of industry, employment, environment, consumer safety & work conditions
- Considering other RTD programmes, coordination
- Strengthening international cooperation
- Research projects must be innovation driven.
- Next call to be published in July 2010 with closing date Dec 2010 and projects starting late 2011 onwards





2011-2013 RTD topics Innovation driven

- Worker protection and exposure risk management strategies for nanomaterial production, use and disposal
- New methods and strategies for measurement, detection and identification of nanoparticles in products and/or in the environment
- Understanding pathogenic mechanisms of nanomaterials interacting with living systems from unicellular species to humans
- Systematic investigation of effects of nanomaterial properties, functionalisation or surface coatings on the mode of action, bioaccumulation / biopersistence and/or human /environmental exposure for (future) modelling
- New methods & approaches for dealing with large scale (accidental) exposures to nanoparticles: Remediation of polluted environments and treatment of acute toxicity following heavy exposure
- Intelligent testing strategies for nanomaterials impact and exposure – towards regulation and clustering of materials





EUROPEAN
COMMISSION

Community research

Information on Nanotechnology in EC

- **Commission Nanotechnologies homepage**

<http://cordis.europa.eu/nanotechnology/>

http://ec.europa.eu/nanotechnology/index_en.html