



EU-U.S. Joint Workshop: European Research Strategies on Nanotechnologies

Prof. Kai Savolainen



Finnish Institute of
Occupational Health

NanoSafety
Cluster



Horizon 2020



- **Horizon 2020 is the financial instrument implementing the Innovation Union, a Europe 2020 flagship initiative to promote and secure Europe's global competitiveness**
- **Nanotechnology included in the *Competitive Industries of the Horizon 2020* proposal;**
- **Horizon 2020 will have a strong focus on developing European industrial capabilities in *Key Enabling Technologies* (KETs). Nanotechnology identified as one of the six Key Enabling Technologies**

Horizon 2020 & Nanotechnologies

- ***Horizon 2020* emphasizes the safety of NT and its applications with a focus on the safe use of knowledge in the assessment of impacts (safety/risks) of ENM on human health and the environment**
- ***Horizon 2020* also aims at promoting science-based governance of nanotechnologies, and providing scientific tools and forums for hazard, exposure and risk assessment and management of ENM considering LCA of ENM.**
- **Timeline for *Horizon 2020*:**
 - **Ongoing Parliament and Council negotiations on the Proposal and EU budget 2014-20**
 - **1/1/2014: *Horizon 2020* would start; launch of first calls**

EU RTD investment in nanosafety research in FPs in total

(source: EC)

- **The EC has funded nanosafety projects since the 5th EU Framework Programme (1998-2002), with a regular budget increase.**
- **Until 2012, 46 nanosafety projects have been funded, representing a total EU investment of 138 M€ (corresponding to total projects costs of 185 M€).**

In addition to FP, Member States annual funding efforts have been recently estimated about 70 M€; hence the European (EU + EU MS) nanosafety funding exceeds 100 M€ annually

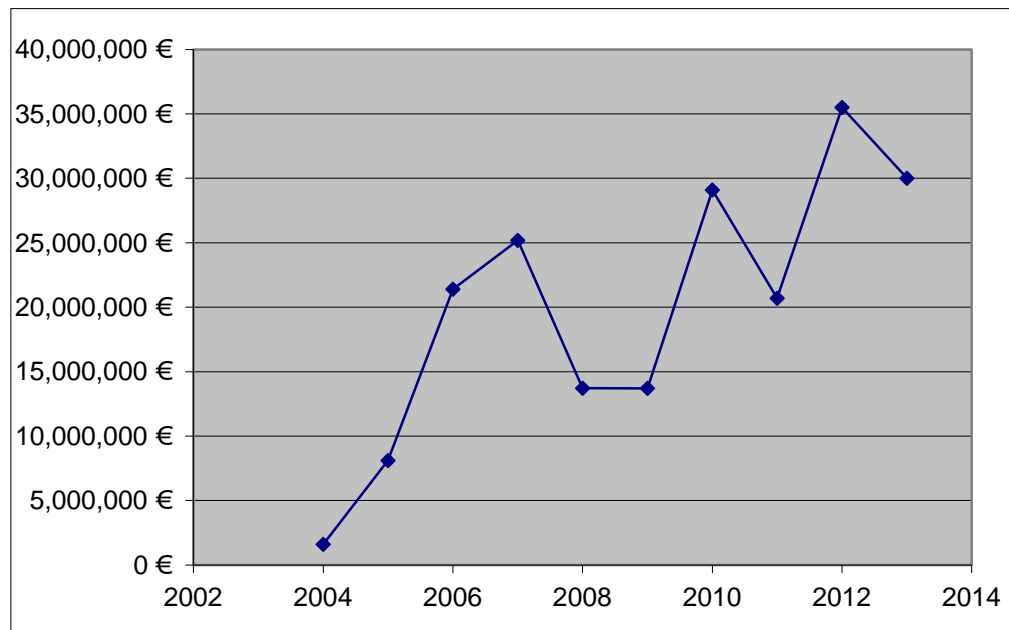
EU RTD investment in nanosafety research in FP7

(source: EC)



- 2007: € 25 M
- 2008: € 14 M
- 2009: € 14 M
- 2010: € 29 M
- 2011: € 21 M
- 2012: € 35 M
- 2013: € 30 M (estimated)

**Total FP7 (estimate): 168 M€
EU funding**



The Nanosafety Cluster

a projects and scientists forum

- To maximise the synergies between the existing FP7 projects on nanosafety.
- To improve the coherence of nanosafety studies.
- To be a forum for dialogue on R&D activities in Europe.
- To facilitate the formation of a consensus on nanosafety.
- To provide all with appropriate knowledge on the risks of ENM for human health and the environment.
- **To produce Strategic Research Agenda for Nanosafety**

Strategic Research Agenda for NanoSafety

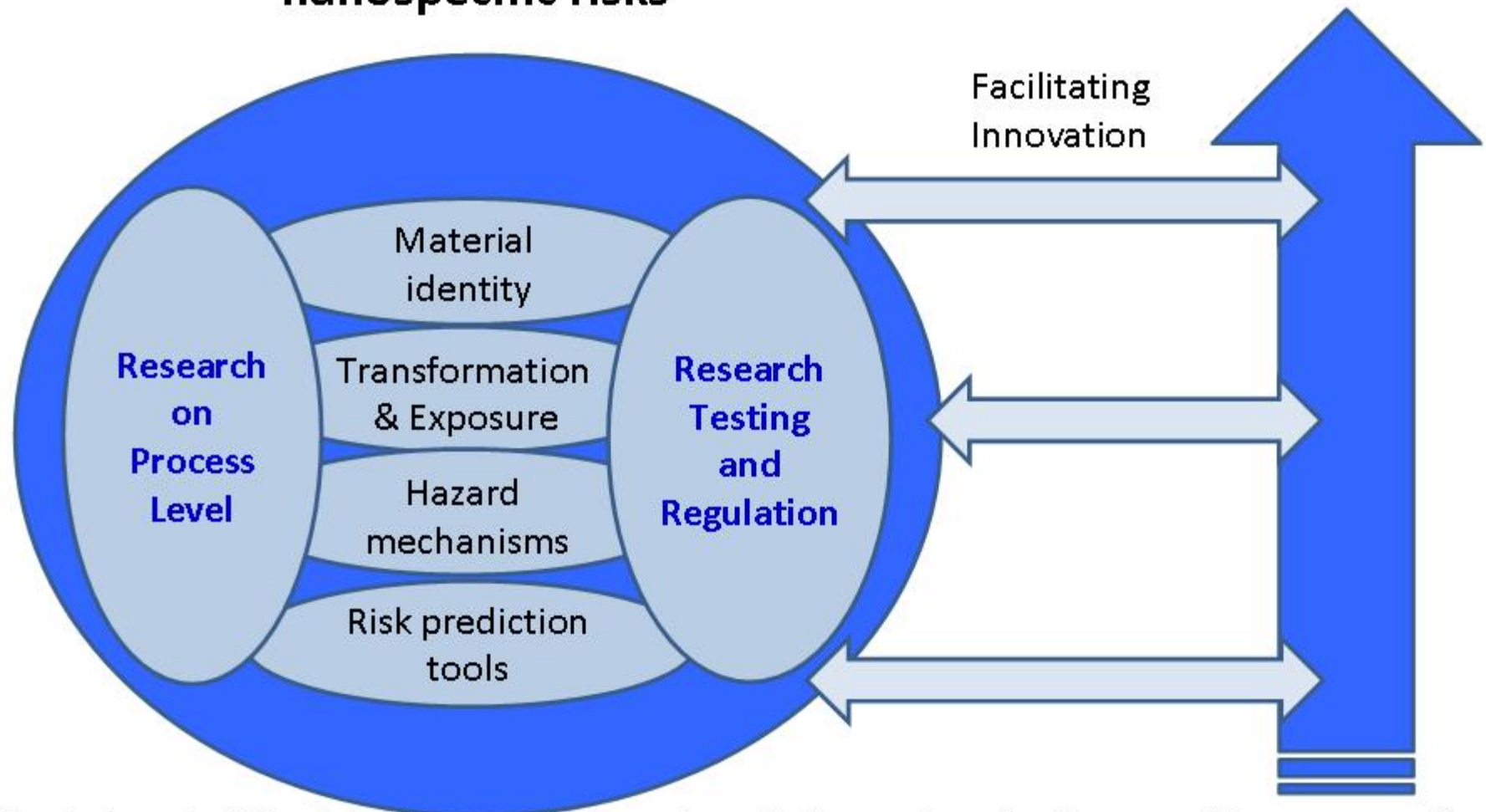


- **Nanosafety Cluster: contribution to the preparation and implementation of the new Framework Programme, *Horizon 2020***
- **Consolidation of the status of nanosafety research in Europe and globally, and to strengthen the EU leadership**
- **Cluster work, produced by the nanosafety research community – creates a common interface and interests with the nanotechnology community**
- **Working document: updated every 4-5 years as more knowledge becomes available**
- **Implementation plan to follow - concerted efforts are needed: integration of national efforts and global cooperation**
- **Contributes to prerequisites of reliable and transparent risk management**

Nanosafety for Innovation and Sustainability

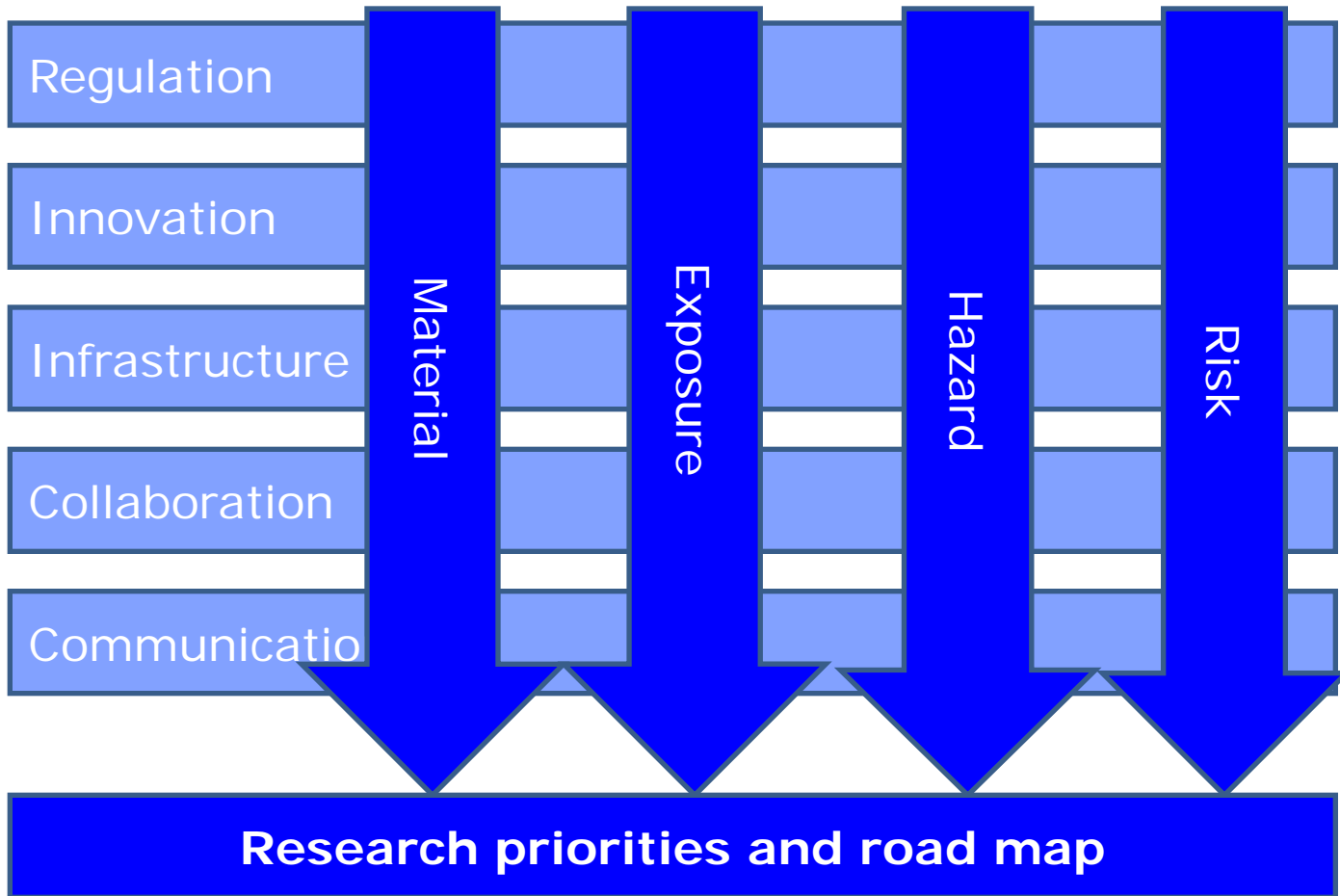
**Predicting of
nanospecific risks**

**New Technologies
and Products**



All subaims shall feed to the overall aims of predicting and controlling possible nanospecific risks

Providing the environment for safe and sustainable use of nanotechnologies



Theme 1. Material identity

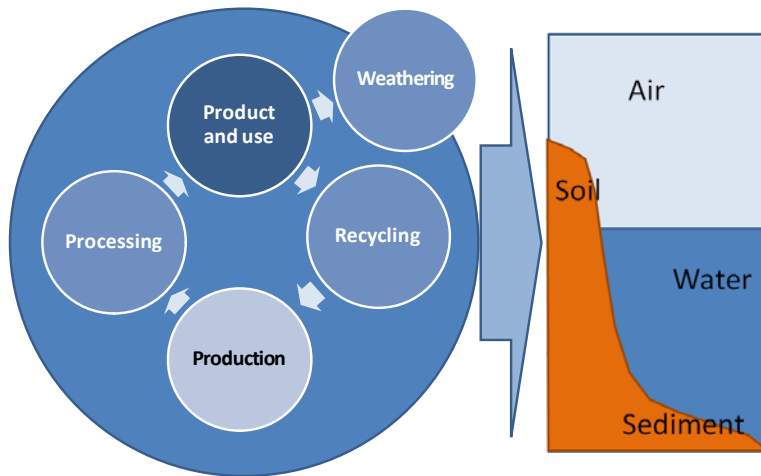


Research priorities:

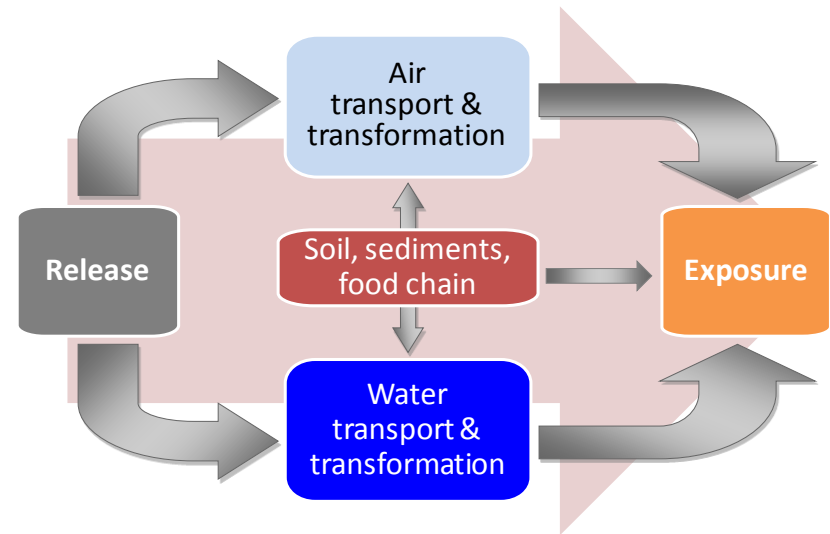
- Develop systematic sets of NMs with properties varied in a stepwise manner that allow assessment of significance of each property for toxicity
- Describe “reference” states and agreed media compositions to enable identification of biomarkers of impact and move towards predictive toxicity assessment
- Understand the longer term fate of particles following interaction with living systems and the role of the corona in this (e.g. corona may delay toxicity / dissolution of NMs etc.)



Theme 2. Exposure, Transformation and the Lyfe Cycle of Engineered Nanomaterials



Nanomaterial life-cycle and release



Nanomaterials from release to exposure

Exposure models

Development, set up and validation of integrated release to exposure models for ENM in workplaces, consumer applications and the environment.

- **Mechanistic understanding of processes determining the release of ENM**

Research priorities:

- Process knowledge to allow the set-up of realistic laboratory simulations
- Database on emission (per time) and release (per material unit) factors

- **Understanding the transformation and transport of nanoobjects**

Research priorities:

- Gain process level knowledge on environmental mobility and transformations for computer simulation of environmental behaviour
- effects of ageing on nanoobjects, including e.g. changes in shape, coatings, surface morphology and chemistry induced by environmental factors (linked to hazard assessment)

Exposure models

- **Understanding and mimicking workplace, consumer and environmental exposure**

Research priorities:

- Comprehensive, harmonized exposure inventories, which allow for the construction of - and serve as a control for - exposure models
- Evaluation of exposure scenario models by comparisons with real world measurements

Theme 3. Hazard mechanisms

Concern-driven Testing

Identification of
“Nanomaterial”

- Nanomaterial Definition



Identification of
“Nanomaterial of Concern”

- Solubility / Dispersability
- Use, Release, Exposure



Identification of
“concerns”

- General concerns
- Exposure route
- Properties of bulk material and modifications of the NM

Identification of
“concerns”

- Biopersistence
- ADCE
- Early biological effects
- Apical biological effects

Targeted Testing

Hazard Mechanisms

Recommendations:

Research priorities:

- Fundamental research on biological and chemical interactions of ENM – important underlying questions
- ‘Blue skies’ research where new ideas and developments can be tested

Theme 4. risk prediction tools

- **Risk Assessment & Management: Development of integrated risk assessment and decision frameworks**

Research priorities:

 - Integration of LCA into RA and RA into decision /risk governance
 - Integration of safe-by-design, closed systems and green NT into the new ENM and their applications
- **Risk Governance: Development of NT specific Risk Governance framework for next generation nanomaterials**

Research priorities:

 - Development of guidance on “concern” assessment , evaluation and management
 - Development of most effective risk communication strategies

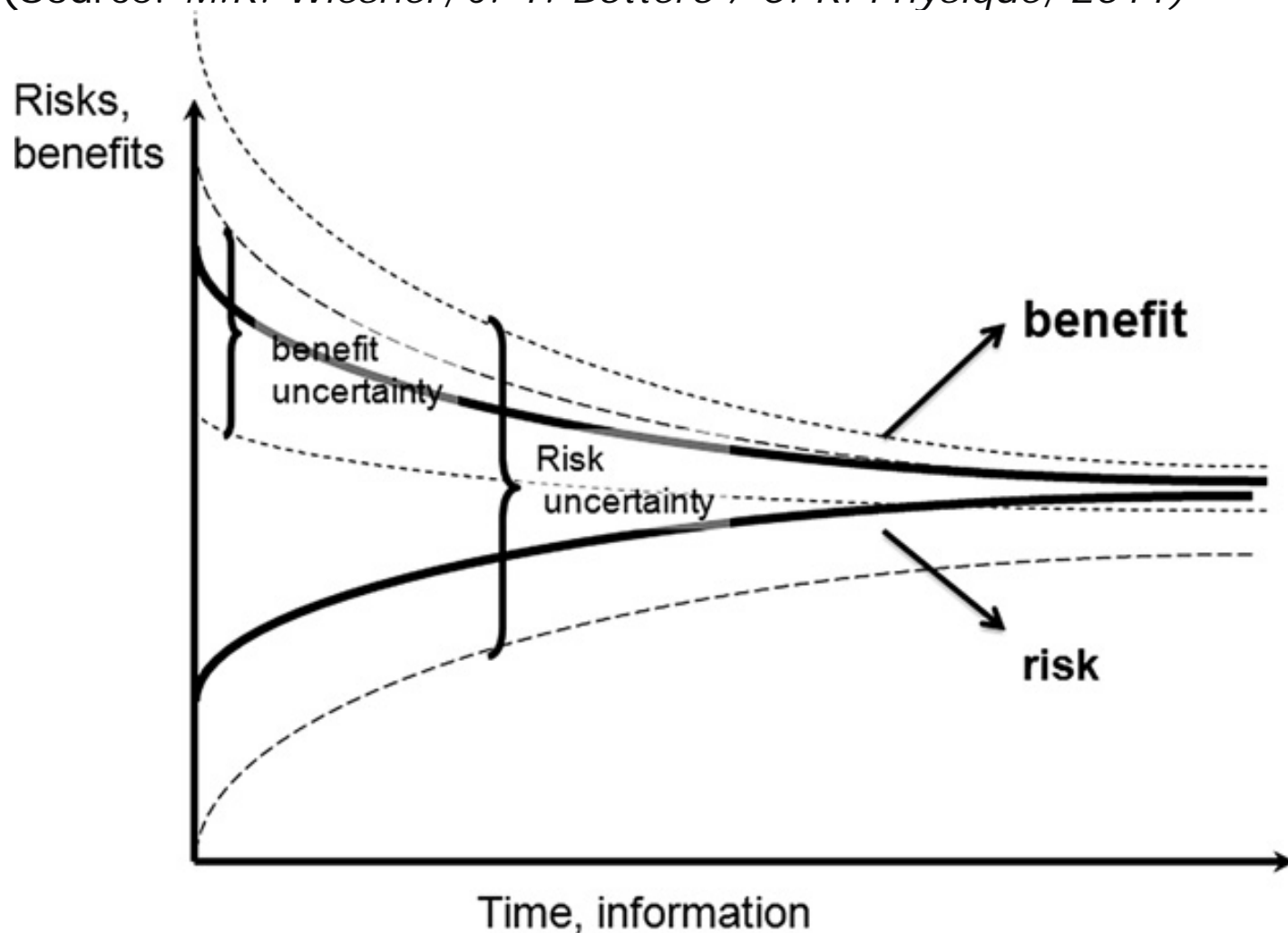
Risk prediction tools

- **Development of Nano QSAR Data base:**
Research priorities:
 - Infrastructure
 - Ontologies
- **Harmonized Framework for Human Health Studies/ Epidemiology:**
 - Research priorities:
 - Quantitative exposure assessment
 - Biological markers of short/long term effect
 - Epidemiological designs and pilot studies

Knowledge reduces uncertainty

Risks, benefits–time relationship

(Source: M.R. Wiesner, J.-Y. Bottero / C. R. Physique, 2011)



NANO*future*s, European Technology Integrating and Innovation Platform on Nanotechnology



- **Integrated Research and Industrial Roadmap for European Nanotechnology - open working document:**
 - **addresses cross-sectorial needs;**
 - **aims at reducing fragmentation, aligning research and innovation efforts for the competitiveness of European NT;**
 - **aims at meeting grand societal and economical challenges through encouraging sustainability in the nano-enabled products**

(http://www.nanofutures.info/sites/default/files/NANOfutures_Roadmap%20july%202012_0.pdf)



Thank You!