EU RESEARCH STRATEGY
Nanotechnologies and Advanced Materials
2018 – 2020

Safe Nanotechnology

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European Commission

Research and Innovation

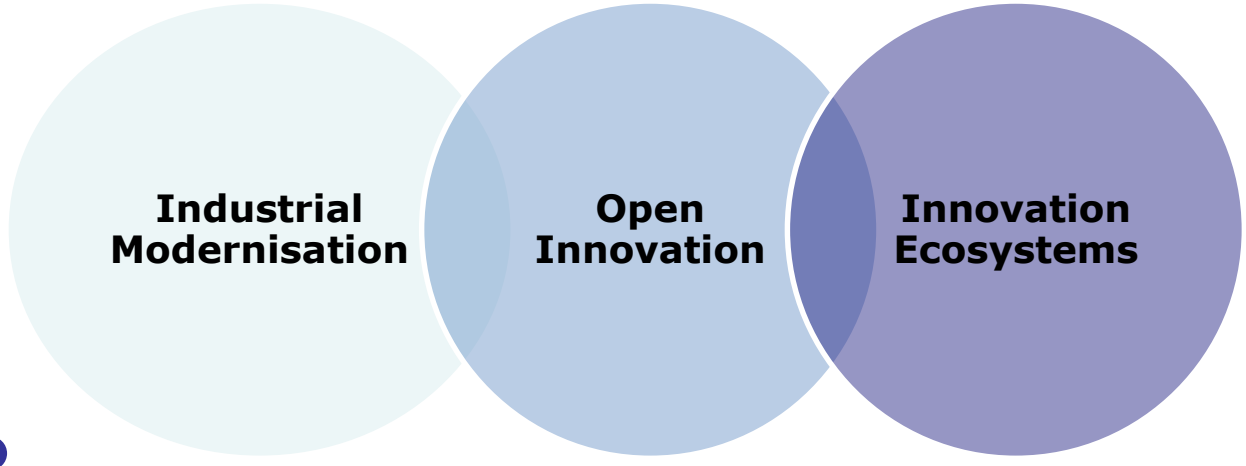
Shaping Europe's Future

June 2015

February 2017

June 2017

Towards European Open Innovation



PILOT LINES
CHARACTERISATION
MODELLING
SAFETY

ACCELERATING PHYSICAL INNOVATION for MATERIALS Industry

In the two KETs:

Nanotechnologies and Advanced Materials

OPEN INNOVATION

FP7-H2020

Research and Innovation

H2020-FP9

Open Innovation Areas

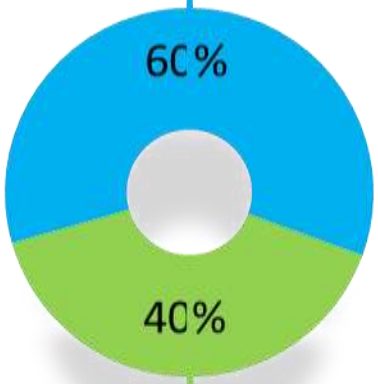
- Lightweight materials and components
- Medical Technologies for Health
- Surfaces and membranes
- Bio-based materials
- Materials for Construction
- Nano-Pharmaceutical
- Characterisation
- Nanosafety
- Modelling

NMBP 2018-2020

Priorities

Bringing the digital to the physical world

Industry 4.0



Circular Economy (20%)

Climate, Energy (20%)

Climate, Energy and the Circular Economy

Calls

FOUNDATIONS for tomorrow's industry (~395M€)

TRANSFORMING European industry (~525M€)

Industrial **SUSTAINABILITY** (~665M€)

Impacts

Eco-system for design/testing/upscaling

Global industrial leadership for re-industrialisation

Less energy input, more energy/ resource efficiency

Research and Innovation

FOUNDATIONS FOR TOMORROW'S INDUSTRY

- *Open innovation*
- *Materials characterisation and computational modelling*
- *Governance, science-based risk assessment and regulatoty aspects*

Indicative planning

- *2018: 6 topics €147 million*
- *2019: 5 topics €115 million*
- *2020: To be defined in 2019*

TRANSFORMING EUROPEAN INDUSTRY

- *Factories of the Future FOF*
- *Bio-Technology BIOTEC*
- *Medical Technology Innovations*

Indicative planning

- *2018: 9 topics; €166 million*
- *2019: 8 topics €189 million*
- *2020: To be defined in 2019*

INDUSTRIAL SUSTAINABILITY

- *Sustainable Process Industry SPIRE*
- *Catalysing the Circular Economy*
- *Clean Energy Through Innovative Materials*
- *Cultural Heritage*
- *Energy Efficient Buildings EEB*

Indicative planning

- *2018: 9 topics; €191 million*
- *2019: 10 topics €232 million*
- *2020: To be defined in 2019*

2016-2017 topics

- Analytical techniques and tools in support of nanomaterial risk assessment

ACEnano and npScope started on 1 January 2017

- Promoting safe innovation through consolidation and networking of nanosafety centres

EC4SafeNano started on 1st Nov. 2016

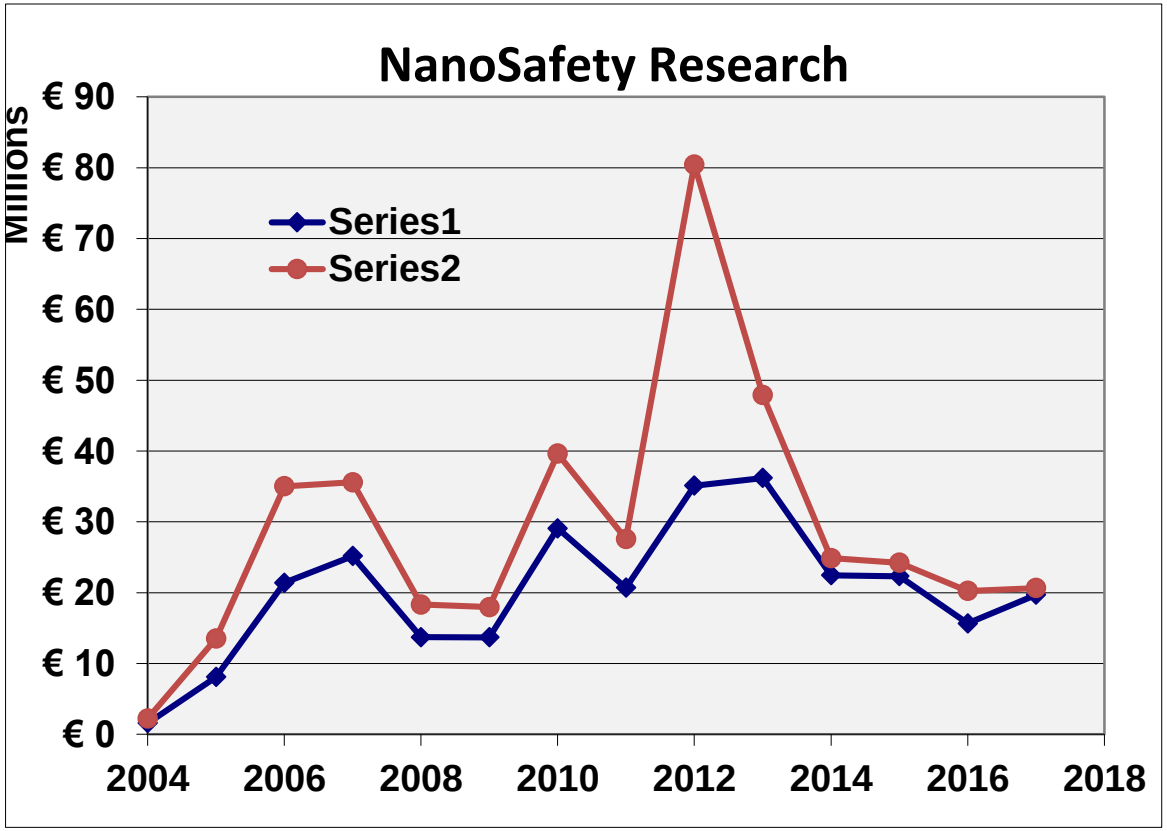
- Advanced and realistic models and assays for nanomaterial hazard assessment

PATROLS to start on 1st Nov. 2017

- Framework and strategies for nanomaterial characterisation, classification, grouping and read-across for risk analysis

GRACIOUS to start on 1st Nov. 2017

Nanosafety research in FPs and H2020 Investment



NB: These figures do not include safety research in application-oriented projects nor nanomedicine

H2020: NMPB Work Programme 2018-20

Nanotechnologies, Advanced Materials, Biotechnology and Advanced manufacturing and processing

GOVERNANCE, SCIENCE-BASED RISK ASSESSMENT AND REGULATORY ASPECTS

- ***2018: Risk Governance of nanotechnology***
- ***2018: Nanoinformatics: from materials models to predictive (eco)toxicology***
- ***2019: Safe by design, from science to regulation: metrics and main sectors***
- ***2020: Safe by design, from science to regulation: behaviour of multi-component nanomaterials***
- ***2020: Regulatory science for medical technology products***

International cooperation is strengthened

H2020: NMPB Work Programme 2018-20

Nanotechnologies, Advanced Materials, Biotechnology and Advanced manufacturing and processing

MATERIALS CHARACTERISATION and COMPUTATIONAL MODELLING

2018: Open Innovation Test Beds for Characterisation (IA)

2019: Real-time nano-characterisation technologies (RIA)

2018: Accelerating the uptake of materials modelling software (IA)

2019: Adopting materials modelling in manufacturing processes (RIA)

2020: Open Innovation Test Beds for Materials Modelling (IA)

2019: Sustainable Nano-Fabrication (CSA) [cooperation with the nanomanufacturing programme of USA-NSF and the NNI Signature initiative]

H2020: NMPB Work Programme 2018-20

Nanotechnologies, Advanced Materials, Biotechnology and Advanced manufacturing and processing

FOUNDATIONS FOR TOMORROW'S INDUSTRY OPEN INNOVATION TEST BEDS

2018: Lightweight, nano-enabled multifunctional composite materials and components (IA)

2018: Safety Testing of Medical Technologies for Health (IA)

2019: Nano-enabled surfaces and membranes (IA)

2020: Bio-based nano-materials and solutions (IA)

2020: Functional materials for building envelopes (IA)

2020: Nano-pharmaceuticals production (IA)

Main directions for next nanosafety NMBP calls

- Integration of scientific, regulatory and market phases
- Integration of civil society for governance
- International cooperation strongly encouraged
- Integration of additional funding from MS sources or industry possible
- Launch of specific calls possible
- Open access and open data access applied
- Respect of ontology and of data logging format
- Strong support to EU regulatory bodies, OECD, ISO, CEN
- Cross project collaboration necessary

NMBP-13-2018: Risk Governance of nanotechnology (RIA)

Specific Objective:

- **To establish transdisciplinary risk governance based on:**
  - a clear understanding of risk,
  - its management practices and
  - the societal risk perception by all stakeholders.
- **It should propose and apply clear criteria for:**
  - risk evaluation and acceptance and
  - transfer of acceptable risk.
- **It should develop:**
  - reinforced decision making tools incorporating those aspects and
  - facilitate risk communication to relevant stakeholders, including industry, regulators, insurance companies and the general public.

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NMBP-13-2018: Risk Governance of nanotechnology (RIA)

Scope:

- **Data and information management** and framework tools with regard to:
  - the safety of nanomaterials for risk assessment,
  - hazard and exposure,
  - human health,
  - environment,
  - and risk mitigation including regulatory aspects of safe-by-design;
- **Responsible communication** with:
  - stakeholders and
  - the civil society based on good quality information and valuable feedback;
- **Plans for future** scientific and regulatory research paying attention to social, ethical and environmental aspects, to achieve:
  - completeness,
  - consistency,
  - maximum synergy of actions and international cooperation;
- **Mechanisms to monitor progress** in several industrial sectors and to revise plans.

TRL 4-6

RIA 100%

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NMBP-13-2018: Risk Governance of nanotechnology (RIA)

Expected impact:

- A transparent, self-sustained and science-based **risk governance council**;
- **Governance framework tools** for managing possible nanotechnologies risks in regard to social, environmental and economic benefits;
- **Availability of high quality data** for industry and regulators decision making;
- **Sustainable solutions** demonstrated at a level that will allow both consistent integration of scientific results and regulatory application of scientifically sound concepts;
- **Consistency of science based risk management approaches** in all EU Member States and synergy with similar actions internationally.

EUR around 5 million(s)

International Cooperation encouraged
Integration of additional funding possible
launch of specific calls possible

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NMBP-14-2018: Nanoinformatics: from materials models to predictive toxicology and ecotoxicology (RIA)

Specific Objective:

Despite the significant amounts of data on physico-chemical and toxicological and ecotoxicological properties of nanomaterials generated over the last decades, **detailed knowledge** on how these properties are linked to specific physico-chemical characteristics **is only beginning to emerge.**

The challenge:

to **develop and implement modern methods**, more cost effective and less reliant on animal testing, for toxicity investigations in each stage of product innovation, through making best use of joining existing and emerging data **with the help of progress in nanoinformatics**.

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NMBP-14-2018: Nanoinformatics: from materials models to predictive toxicology and ecotoxicology (RIA)

Scope:

- Development of models that support the prediction of both specific functionalities and hazard and are crucial to establish **safe-by-design principles at early stages** of material development;
- Development of a **sustainable multi-scale modelling framework**, based on the integration/linking of different types of nanoinformatics models in order to advance towards predictively linking of physico-chemical NM property models to NM functionality and hazard;
- Uptake and valid use of these tools and nanoinformatics models, **user-friendly interfaces** to enhance accessibility and usability of the nanoinformatics models, and clear explanations of their applicability domains, especially regulatory compliance, should be provided **for different stakeholders** (industry, regulators, and civil society).

TRL 4-6

RIA 100%

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NMBP-14-2018: Nanoinformatics: from materials models to predictive toxicology and ecotoxicology (RIA)

Expected impact:

- **Reliable nanomaterials safety data systems**, models and strategies to allow material characteristics to be linked to adverse outcomes;
- A **validated accessible framework**, designed to predict human and environmental toxicological hazards;
- **Increased confidence** in nanosafety nanoinformatics predictive models through agreed standards, harmonised standard operating procedures, considering OECD validation principles.

EUR around 6 million(s)

International Cooperation encouraged
Integration of additional funding possible
launch of specific calls possible

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NMBP-15-2019: Safe by design, from science to regulation: metrics and main sectors (RIA)

Specific Objective:

- **Risk management involves**
  - quantifying hazard (toxicity) and exposure,
  - taking the necessary steps to reduce both to acceptable levels, ideally at an early stage of the nanomaterial development process (Safe-by-Design).

- **Various industrial sectors**
  - in particular structural or functional materials,
  - coatings and cosmetics,
  - as well as pharma and health technology

  are currently searching for ways to mitigate possible risks from nanomaterials and nano-containing products.

The challenge now

- to distil existing methods into
  - simple,
  - robust,
  - cost-effective methods
- for monitoring and modelling of physical-chemical properties and biological effect assessment of nanomaterials in relevant use conditions including in product-relevant matrices.

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NMBP-15-2019: Safe by design, from science to regulation: metrics and main sectors (RIA)

Scope:

- **Degradation** of nano-enabled products and ageing of nanomaterials, and mixture toxicity;
- **New Safe by Design** methods that enable reduction of hazard and exposure through design to an acceptable risk level without affecting the material performance and guide development of safer products at different stages;
- Implementation of **control measures and mitigation strategies** for nanomaterials specific scenarios in various industrial sectors to reach acceptable regulatory risk level on the effectiveness of such measures, and develop computational approaches to model them;
- For this topic the **parallel calls scheme** is envisaged with the USA-NNI. Resulting projects should establish **close cooperation** mechanisms. Legal, policy making and Responsible Research and Innovation aspects should be integrated in the proposal.

TRL 4-6

RIA 100%

European Commission

NMBP-15-2019: Safe by design, from science to regulation: metrics and main sectors (RIA)

Expected impact:

- **Safe by design approaches** and tools at an early stage of the nanomaterial development process;
- **Quality workplaces** that ensure maximum technical and economic performance in line with acceptable risk levels;
- **Control and mitigate exposure** to acceptable risk level in case after release of nanomaterials from products;
- Develop and validate **low-cost techniques** for delivering an integrated exposure driven risk assessment and the associated design of the required post-use monitoring.

EUR 5-6 million(s)

International Cooperation encouraged
Integration of additional funding possible
launch of specific calls possible

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Thank you for your attention!

Find out more:

www.ec.europa.eu/research/horizon2020