The European NanoSafety Cluster

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The Nanosafety Cluster (NSC): Background & history

- Namur, 2009
- Initiative of the EC DG for Research and Innovation, which sponsors research in nanosafety.
- Aim: to maximise synergies between European-level projects addressing the safety of NMs & technologies.
- Topics: toxicology, ecotoxicology, exposure assessment, mechanisms of interaction, risk assessment and standardisation.
- New leadership as of February 2017

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The Nanosafety Cluster (NSC)

In a few words:

- Overall, Europe targets safe & sustainable NMs and nanotech.
- Cluster projects contribute to assuring environmental health and safety (EHS) of this Key Enabling Technology.
- NSC aspires to be the authoritative voice of nanosafety

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NSC projects: past, present, future

- More than 30 projects completed
- 27 current projects
- Members include academic organisations, industry, NGOs and GOs
- Members come from EU countries mostly but also outside Europe
- CoRs with US, many other countries

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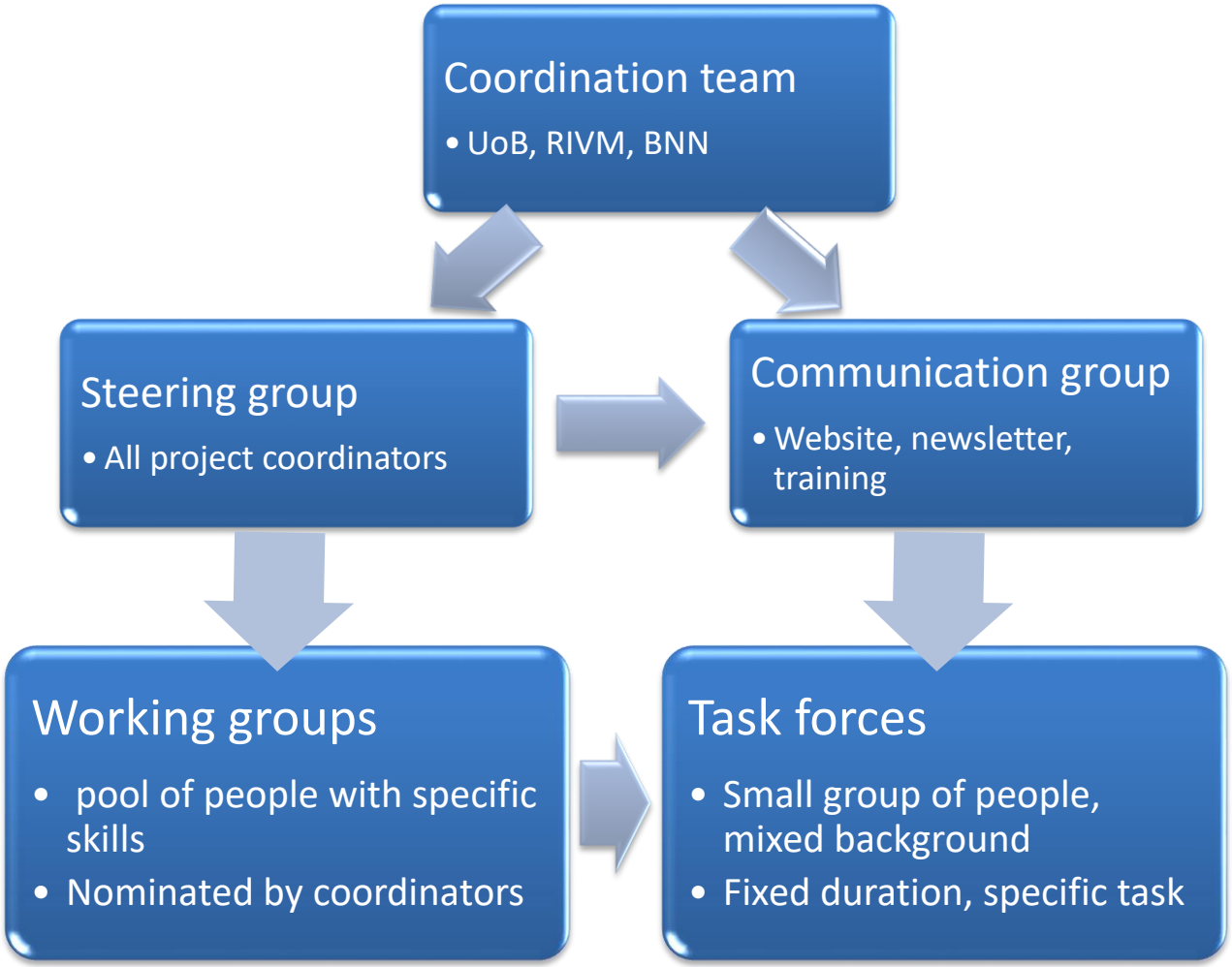
NSC: how does it work



EU Commission
- DG & RI

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NSC mission

- Act as **high profile platform** for coordination of nanosafety research
- Provide **strategic direction** for the EU &MS
- **Enhance synergies** between projects
- Preserve project **outputs and data**
- **Integrate & synthesise** nanosafety knowledge
- Provide **a unified message to stakeholders** including regulators, industry and civil society.
- Over time, transition to an **Innovation Governance platform.**

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NSC: a commitment to stay agile

- WGs restructuring
- Introduction of task forces
- Responsive and listening
- Active and participatory
- Self-reflective and horizon scanning

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Distinction between TF and WG

Task Force	Working Group
Addresses a specific identified stakeholder need	Bottom-up activities of interest to several NSC projects
Agreed and refined by SC	Agreed by WG leadership
Has fixed timescale (~ 6 months), scope and output / deliverable	No fixed timescale, but requires clear scope and regular activities/outputs
Call for membership via website & SC	Projects self-select interest to contribute
SC approve final output	Update on activities via website and Compendium

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Working Groups

- WG A • Training and education
- WG B • Materials & standards
- WG C • Exposure & hazard assessment
- WG D • Models & tools for RA
- WG E • Safe by Design & Innovation
- WG F • Data management
- WG G • NEW: Governance & Regulation

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Task Forces

1. Definition of safe(r)-by-design
2. Exposure database
3. Review of nano-TiO_2 safety
?4. Emerging (carbon) materials

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NSC activities

- Meetings
- Young scientists forum
- Stand alone workshops (e.g. Data harmonisation)
- Webinars
- Written outputs (vision document, nanoinformatics roadmap, compendium, self reflection)

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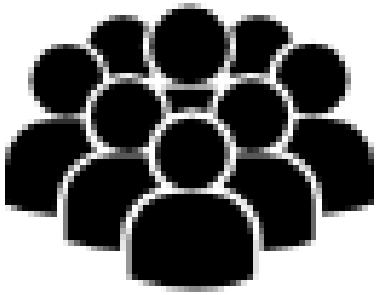
NSC activities



Benefits from the NSC to:

- to researchers
- to industry (nanomaterials producers, NM-containing products and applications developers)
- Regulators, policy makers
- Consumers, public

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Examples of recent activities

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TF: Review of nano-TiO_2 safety data

with thanks to Damjana Drobne

Background:

- **Substance Name (Public Name):** Titanium dioxide
- **Chemical Group:**
- **EC Number:** 236-675-5
- **CAS Number:** 13463-67-7
- **Submitted by:** FRANCE
- **Published:** 20/03/2013
- Update 22/03/2016

https://echa.europa.eu/documents/10162/1b641004-a9ea-466d-9f45-b6aa8babbec1

http://echa.europa.eu/doc/reach/evaluation/background_doc_criteria_ed_32_2011.pdf

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TF: Review of nano-TiO_2 safety data

with thanks to Damjana Drobne

What can the NSC & TF TiO_2 do?

TF will prepare a state of the art knowledge on:

- Definition of 'Intrinsic' hazardous property of a substance to be used by regulators
- Particle clearance mechanisms and detoxification what should be taken into account when discussing nanosafety
- Hazards of poorly soluble low toxicity particles (PSLTs): how homogeneous / versatile is this group of substances in terms of safety
- Defining and (re)defining hazard, toxicity and risk of (nano)materials for regulatory purposed and for communication with public.

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Examples of recent activities

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The power of good science & joint activities

nature nanotechnology

PERSPECTIVE

https://doi.org/10.1038/s41565-018-0185-0

Advanced tools for the safety assessment of nanomaterials

Bengt Fadeel[1], Lucian Farcal[2], Barry Hardy[2], Socorro Vázquez-Campos[3], Danail Hristozov[4], Antonio Marcomini[4], Iseult Lynch[5], Eugenia Valsami-Jones[5], Harri Alenius[1,6] and Kai Savolainen[7]*

Engineered nanomaterials (ENMs) have tremendous potential to produce beneficial technological impact in numerous sectors in society. Safety assessment is, of course, of paramount importance. However, the myriad variations of ENM properties makes the identification of specific features driving toxicity challenging. At the same time, reducing animal tests by introducing alternative and/or predictive in vitro and in silico methods has become a priority. It is important to embrace these new advances in the safety assessment of ENMs. Indeed, remarkable progress has been made in recent years with respect to mechanism-based hazard assessment of ENMs, including systems biology approaches as well as high-throughput screening platforms, and new tools are also emerging in risk assessment and risk management for humans and the environment across the whole life-cycle of nano-enabled products. Here, we highlight some of the key advances in the hazard and risk assessment of ENMs.

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The power of good science …

Box 1 | Cooperation in nanosafety research in the EU and beyond

The EU Nanosafety Cluster (www.nanosafetycluster.eu) is a forum for EU-funded projects addressing the safety of nanomaterials and nanotechnologies. The main aims are to promote synergy among these projects and foster collaboration for maximizing impact, policy elaboration and international cooperation. The forum is an initiative of the European Commission Directorate-General for Research and Innovation. The Nanosafety Cluster Compendium, updated on an annual basis and available on the website, provides a concise snapshot of all the current and recent projects. Two large projects, FP7-NanoMILE (www.nanomile.eu-vri.eu) and FP7-NANOSOLUTIONS (www.nanosolutions-fp7.com) focused on new tools for hazard assessment of ENMs including HTS and systems biology-based approaches, while FP7-eNanoMAPPER (www.enanomapper.net) aimed at creating a community framework and a common language to accelerate cooperation. Several new projects are underway in the Horizon 2020 programme, including NanoFASE (www.nanofase.eu), a project that aims to develop an exposure assessment framework to evaluate the environmental fate of nanomaterials, and caLIBRAte (www.nanocalibrate.eu), a consortium that seeks to develop a risk governance framework for ENM and nano-enabled products. The newly launched European Union Observatory for Nanomaterials (www.euon.echa.europa.eu) hosted by the European Chemicals Agency, provides a useful repository of information related to safety, innovation and use of ENM. The US–EU nanoEHS dialogue or platform (www.us-eu.org), in its turn, has as its main goals to promote an active discussion about environmental health and safety (EHS) questions for nano-enabled products, encourage joint programs that would leverage resources, and support the communities of research—largely self-managed working groups for scientists and other stakeholders.

Indeed, the need for a federated database system linking and transparently integrating all available information sources related to nanosafety is illustrated by the recently established European Union Observatory for Nanomaterials, hosted by the European Chemicals Agency. This umbrella resource (Box 1) aims to provide an entry point to the respective repositories of EU-funded research results, models and tools, and bring together the community knowledge, thereby reducing its fragmentation. Furthermore, to pursue the optimal usage of this data, a system should consider the FAIR data principles of findability, accessibility, interoperability and reusability of data and the algorithms, tools and workflows that operate on it. Therefore, recent community efforts have focused on building such computational frameworks and infrastructures for ENMs, adopting an interoperable design and enabling effective and integrated approaches in risk assessment. Researchers at the Joint Research Centre of the European Commission recently published a state-of-the-art review of the currently available computational approaches for safety assessment of ENMs[14].

Another major challenge for the nanosafety community is the establishment of common languages, standards and harmonized infrastructures relevant to the needs of stakeholders in the nanosafety area. Ontologies, that is, structured, controlled vocabularies, are needed to support the automation of information systems and link these to the chemical and biological properties of ENMs. The EU-funded project, eNanoMapper, and other international initiatives have worked towards developing nano-specific ontologies allowing the standardization of the terminology in the nanosafety domain, and developed a substantial vocabulary to be used in nanotechnology and safety assessment[15]. This ontology can be used for harmonization purposes. To exemplify, the infrastructure developed by the eNanoMapper project is supported by such agreed (nano-specific) language, on an open platform for integrating and accessing different ENM data sources[16]. Several other EU projects have adhered to the same approach, including NANoREG, and the aim is to make the database widely available to the com-

What can we do for the Greek platform?

- Share information, alignment
- Expert advice
- Collaborations, initiatives, joint activities

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