NANO2ALL

SOCIETAL ENGAGEMENT ON RESPONSIBLE NANOTECHNOLOGY

# Best Practices Database

THE NANO2ALL PROJECT HAS RECEIVED FUNDING FROM THE EUROPEAN UNION'S HORIZON 2020 RESEARCH AND INNOVATION PROGRAMME, UNDER THE GRANT AGREEMENT NUMBER 685931.
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| **Deliverable number:** | **D2.5** |
|---|---|
| **Deliverable name:** | **Best Practices Database** |
| **WP / WP number:** | 2 |
| **Delivery due date:** | Project month 42 (25/03/2019) |
| **Actual date of submission:** | 10/07/2018 (extended deadline) |
| **Dissemination level:** | public |
| **Lead beneficiary:** | ΣΥΣΤΑΣΗ (Systasi Consulting) |
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| **Contributor(s):** | SPI, VILABS, MALSCH Technovaluation, VU/VUmc, NANOfutures, APRE, UNINOVA, Ecsite, EUSJA |

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# 1. Introduction

# 1. Introduction

## 1.1. NANO2ALL project

NANO2ALL is a 3.5-year-long European dialogue project that aims to contribute to the establishment of Responsible Research and Innovation (RRI) practices in the field of nanotechnology. It is focused on transparent co-production of knowledge through inclusive and participatory approaches, including national and EU-level dialogue sessions that engage both citizens and relevant stakeholders.

Funded by the European Union (EU) and led by SPI (Sociedade Portuguesa de Inovação), the NANO2ALL project addresses the "societal engagement on responsible nanotechnology" topic of the Call for Nanotechnologies, Advanced Materials and Production of the Horizon 2020 Work Programme 2014-2015. In the past, various other engagement projects, public surveys and deliberative experiments related to nanotechnology have been performed. NANO2ALL builds on these activities and aims to further the discussions on what would be needed to enhance societal engagement in nanotechnology research and innovation processes. The main aim of NANO2ALL is to contribute to the responsible development of nanotechnology by establishing a European-wide sustainable platform for mutual learning and informed dialogue among citizens and stakeholders involved in the co-production of knowledge.

The project website is an online-tool which documents the NANO2ALL process and provides open data access to the results of the project's activities. Visit www.nano2all.eu for more information.

One of the core tasks of WP2 – Developing a common understanding, under which this report integrates, was the identification of best practices on Responsible Research and Innovation in Nanotechnology with a focus on societal engagement, across Europe and beyond. The purpose of this task (Task 2.2) was to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in the European region. The results of this task are included in this report.

## 1.2. Best Practices Methodology

This chapter provides an overview of the methodology that was designed and put into practice for the development of the Nano2All Best Practices Database. The methodology was structured to serve the needs of the project through a collective and continuous reflection exercise which was dynamically updated throughout the Nano2All project lifetime.

### 1.2.1 Best Practices preparation - The criteria

As a first assumption towards the definition of what a best practice would be, the Nano2All project team agreed to opt for *good* – as opposed to a futile quest for the best - practices as initiatives that could be *interesting* and *inspiring* in the context of RRI. The choice of those good practices would particularly embrace *recent* initiatives with special emphasis on *diversity* as to encompassing a variety of different cases.

The first step for the identification of good practices was the definition of a specific set of criteria concerning the preparation of the practice, the practice itself and the outcomes and impact obtained by it. In the context of this

task, the framework we used for conceptualizing RRI was set by the definition provided by EC:

> **Responsible Research and Innovation means that societal actors work together during the whole research and innovation process in order to better align both the process and its outcomes, with the values, needs and expectations of European society. RRI is an ambitious challenge for the creation of a Research and Innovation policy driven by the needs of society and engaging all societal actors via inclusive participatory approaches. RRI consists of the following 6 keys: Engagement, Gender equality, Science education, Ethics, Open Access and Governance.**[1]

And the RRI Tools project:

> **Responsible Research and Innovation is a dynamic, iterative process by which all stakeholders involved in the R&I practice become mutually responsive and share responsibility regarding both the outcomes and process requirements.**

For the identification of good practices in RRI, the following criteria were proposed to be used in the following manner: the questions below have been structured in a "yes/no" binary type of approach. In order for a practice to be enlisted as "good practice" it should have a "yes" type of response in at least one of the three categories (preparation of the practice, practice and outputs and impacts), as we envisaged practices that have been appropriately designed, elaborated and that have produced valuable outcomes and results. The criteria proposed under each phase of the practice are presented hereunder:

***Good Practice Criteria***

***Preparation of the Practice***

i. ***Educational aspects of the activity:*** *did any educational activity take place prior to the RRI practice? (yes/no)*

ii. ***Levels of analysis****:*

   a. *Did an actor analysis take place, identifying all whom the practice might impact on, might have an interest in, and might have relevant expertise for the practice, and identifying how these actors relate to each other?); (yes/no/unknown)*
   b. *Were a number of definitions of the problem/issue identified and presented prior to the conduct of the engagement activity? Yes/no/unknown*

***The Practice***

iii. ***Spectrum of engaged stakeholders*** *(wide range, relevant voices, demographic/gender/ethnographic diversity, sufficient number, wide public involved, early involvement of stakeholders)*

   a. *Diversity of different stakeholder groups engaged: yes/no/unknown*
   b. *General public involved: yes/no/unknown*
   c. *Female participants equal to male participants: yes/no/unknown*
   d. *Multi-ethnicities participants: yes/no/unknown*

iv. ***"Upstreamness" of engagement activity*** [2]***:***

   a. *Did a policy dialogue occur? Yes/no/unknown*

[1] European Commission (2012b): Responsible Research and Innovation: Europe's ability to respond to societal challenges, DG Research and Innovation

[2] "Dialogue and deliberation amongst affected parties about a potentially controversial technological issue at an early stage of the Research & Development process and in advance of significant applications or social controversy". Royal Society and Royal Academy of Engineering (2004) Nanoscience and Nanotechnologies: Opportunities and Uncertainties. London: RS/RAE.

v. ***Diversity of participatory methods used****: Were R&I methods developed or discussed with different stakeholders so that they respond to the needs and expectations of the different stakeholders? (yes/no/unknown)*

vi. ***Ethics and legislation****: have ethical and legal aspects of the practice been addressed? yes/no/unknown*

***Outcomes and Impacts obtained***

vii. ***"Midstreamness" of engagement activity[3]:***
   a. *Were ethical and social considerations integrated in the practical, day-to-day decisions of research and innovation processes, as a result of the RRI engagement practice? Yes/no/unknown*

viii. ***Envisioning plausible futures****:*
   a. *Has there been active identification and consideration of immediate, mid-term and long-term social, environmental and economic impacts and consequences of the practice –intended and unintended? (yes/no/unknown)*
   b. *Have alternative research and innovation trajectories been considered and discussed? (yes/no/unknown)*

ix. ***Increase of awareness:*** *Through the process, have the stakeholders become (more) aware of the differences of their own perceptions vs. the perceptions of others as well as their own responsibilities? (yes/no/unknown)*

x. ***Increase of engagement:*** *Through the process, has there been an improvement in the engagement of the public? (yes/no/unknown)*

xi. ***Flair of change:*** *Did any of the actors take action as a result of the dialogue? Yes/no*

*If YES:*

   i. *Change of research process*
   ii. *Change of policy direction*
   iii. *Change in media coverage*
   iv. *Involvement of CSOs*
   v. *Other (open response option)*

Those criteria (finalized on Month 3 of the project) were applied to a multitude of cases which were detected through an extensive literature review. Fifteen cases satisfied the criteria and were assigned to partners for reporting.

### 1.2.2 Best Practices – the elaboration

After having finalized the criteria to be used for the identification of good practices, partners reflected on the appropriate structure for reporting on the case studies. The reports should be presented in the form of an - approximately 4 to 5 pages long - leaflet introducing a concise overview of the RRI practice. The reports should take into consideration the type of information that would be interesting to be available to readers from all stakeholder groups (from policymakers to the general public) and they should be structured on the basis of the following sections:

a) *Executive summary* outlining the Nano2All project and the purpose of the report

b) *Background context* describing the field of research or industry involved in RRI and designating the stakeholder's perspective from which the practice is stemming.

c) *Process of the engagement activity* elaborated and stakeholders involved. This section outlines the steps taken from the preparation to the results and outputs of the practice taking into account the level of engagement

[3] "Midstreamness starts from the idea that upstream engagement, which largely occurs in the policy room, does not necessarily affect the research and innovation processes. Midstream engagement focuses on the opportunities to integrate broader social and ethical considerations in the practical, day-to-day decisions of research and innovation processes". http://www.nanodiode.eu/wp-content/uploads/2014/04/NanoDiode_WP1_Best_Practices.pdf [accessed 25/11/2015]

of the involved stakeholders, the positioning of the engagement activity across the value chain (upstreamness / midstreamness), the educational aspects of the activity, the diversity of participatory methods used, the levels of analysis, the ethics and legislation.

d) *Findings and lessons learned*. This section refers to the process as well as to the stakeholders. The findings of the practice as to its uptake and impact are detailed and recommendations are provided regarding the future implementation of similar societal engagement practices.

The above structure was consistently adapted to the singular character of each of our fifteen collected case studies. The final reports were developed through desk research and interview(s) with experts. Partners who had undertaken the elaboration of one or more case studies had the opportunity to use and adapt to their best interest an *interview grid* developed on the basis of the good practice criteria. The interview grid was either sent to the interviewee(s) for the preparation of the discussion or served as an inspiration for shaping the questions to be discussed with the expert(s).

In view of the elaboration of the *Nano2All Roadmap*, partners used some of the selected cases to serve the purpose of this final deliverable. In other words, the interviewees were sometimes consulted with the aim to extract recommended actions that will allow the further uptake of RRI approaches with a focus on societal engagement across the (nanotechnology) research, development and innovation (RDI) value chains. In all cases, the findings and lessons learned of the good practices were capitalized on the Roadmap resulting to the shaping of the main recommendation lines.

The practices are uploaded on the Nano2All website under http://www.nano2all.eu/resources/nano2all-collected-practices-of-engaging-society-in-nanotechnology-development/

## 1.3. Best Practices outcomes & results

This chapter provides a synthesis of the main points addressed within the framework of the fifteen case studies identified as best practices for Nano2All.

### 1.3.1 Best Practices – an overview

The fifteen case studies identified within Task 2.2 provide a diversity of societal engagement practices spanning the innovation value chain. All of the case studies raise questions strongly related to the Nano2All scope and objectives and give valuable insights on how different societal engagement procedures can be put in place within different contexts. In some cases, the reports provide evidence-based recommendations considering the broader integration of societal considerations in the RRI system. The recommendations addressed by the case studies were used as a source to the formulation of policy actions for the *NANO2ALL Roadmap (D4.1)*.

The fifteen case studies are briefly presented below:

**Dialogue Forum Nano of BASF / Germany**

- At the peak of the GMO debate (2006) Chemistry company engages in a dialogue with civil society organisations (CSOs), including German and European NGOs, trade unions, and churches

**Societal Incubator for nano / Rathenau Institute / The Netherlands**

- A platform to serve the interest of innovators who have an idea of a particular innovation and recognise the surrounding uncertainties that may negatively influence its societal acceptance

**Technology of Imagination: a card-based public engagement method / Austria**

- IMAGINE is a qualitative research method, developed with the purpose to be validated as tool for qualitative research on societal engagement in emerging technologies (e.g. nanotechnologies) and applied in the Austrian context with 24 participants between November 2009 and January 2010.

**NanoRESP Forum / France**

- A multi-actor dialogue forum fostering practices of responsible innovation. Since 2013 it promotes an open, non-confrontational albeit critical stakeholder dialogue on nanosciences and nanotechnologies (N&N).

**NanoTRUST / Austria**

- NanoTrust is a technology assessment (TA) project carried out by the Institute of Technology Assessment of the Austrian Academy of Sciences. Its aim is to support the establishment and maintenance of a governance network and to take a more active role in contributing to pre-emptive risk management and the initiation of new governance processes – especially in risk and safety assessment and management.

**H2020 NanoDiode Multi – Stakeholder dialogues**

- NanoDiode organised a series of citizens' dialogues in Austria, France, Italy, Germany, the Netherlands and Poland in 2014-2015 complementing the project's objective to develop a coherent picture of how public perceptions can be fed into research and policy processes.

**BMBF – Citizens meet experts / Germany**

- A societal engagement practice which brings together citizens and experts to discuss Research and Innovation (R&I) in Nanotechnology in Germany. The practice is implemented by the German Ministry of Education and Research (BMBF).

**Futurescape City Tours / Center for Nanotechnology in Society (CNS) / Arizona State Uni (ASU) / US**

- A technique of engaging the public with science and technology centered on a walking tour in an urban environment where participants go behind-the-scenes, take photographs, have informal conversations with city planners, policymakers, researchers, and civic leaders and deliberate on the future of their cities or communities, revealing the role of technology in our everyday life.

**UK Environmental Agency – Nanodialogues / People's Inquiry on the use of nano in land remediation / UK**

- One of four dialogues held as an experiment in upstream public engagement with nanotechnology funded by the British government's Office of Science and Innovation and conducted from January 2006 through January 2007 by the British think tank Demos.

**Dutch societal dialogue on nano / The Netherlands**

- A dialogue mandated by the Dutch government and coordinated by a special committee (CieMDN). It was implemented from 2009 till 2011 in the form of small projects carried out by CSOs.

**UNITAR's nanotechnology workshops in Latin America and the Caribbean**

- Analysis of the role of societal engagement in a series of regional workshops on nanosafety organised in Latin America with the support of the United Nations Institute for Training and Research (UNITAR).

**FP7 NANOPLAT**

- Development of a deliberative process based on a science-based platform for a stakeholder dialogue to enable an ongoing process of collective responsibility

**FP7 Time for Nano**

- A project aiming to engage the general public, with a special attention to young people, on benefits and risks related to nanoscale research, engineering and technology, through specific informal education products.

**H2020 Nano2All Multi-stakeholder dialogues**

- A range of dialogue events across Europe using a three-phase dialogue approach:1) a set of national citizen dialogues in 6 EU countries 2017, 2) a set of national multi stakeholder dialogues in the same 6 countries (2017-2018), and 3) the organization of a final EU stakeholder dialogue event in Brussels (2018)

**H2020 PRISMA / NanoCUBE pilot study**

- A project coordinated by the companies ARCHA and TECHA, aiming to integrate principles of RRI in the development of nanomaterials for cosmetics.

### 1.3.2 Best Practices - Findings and lessons learned

The evidence accumulated through the desk research and the interviews conducted for the Nano2All good practices identification confirms that, in the domain of nanotechnology research and innovation, RRI approaches are adopted and implemented in a range of EU Member States (MS), as well as at EU and international level.

Desk research also shows that these interactions often take place as part of the national and European nanotechnology governance processes in support to science and technology policy-making, research agenda setting, and more rarely in support to aligning individual nanotechnology research and innovation processes with societal needs, concerns and expectations (Nano2All 2019). The categories identified below according to the processes used and the funding received, reflect the above finding and confirm the existence of **a grand majority of top-down initiatives – all Nano2All reported cases with the exception of the NanoRESP Forum which was initiated by an NGO and which surprisingly enough is one of the two (together with NanoTrust) out of fifteen, sustainable, continuous platforms.**

The first category consists of **projects having received research and innovation funding by the EU**, either implemented during the period 2007 – 2013 (FP7) or implemented during the period 2014 – 2020 (H2020):

- H2020 PRISMA / NanoCUBE pilot study
- H2020 Nano2All Multi-stakeholder dialogues
- FP7 Time for Nano
- FP7 NANOPLAT
- H2020 NanoDiode Multi – Stakeholder dialogues

The second category includes **projects financed by national public funds - mostly in countries dedicating considerable funding in nanotechnologies - implemented by Ministries or mandated to independent research institutes, in the framework of national nanotechnologies' policies**:

- Societal Incubator for nano / Rathenau Institute / The Netherlands
- NanoTRUST / Austria
- BMBF – Citizens meet experts / Germany
- UK Environmental Agency – Nanodialogues / People's Inquiry on the use of nano in land remediation / UK
- Dutch societal dialogue on nano / The Netherlands
- Futurescape City Tours / Center for Nanotechnology in Society (CNS) / Arizona State Uni (ASU) / US
- Technology of Imagination: a card-based public engagement method / Austria

This category could also include the UNITAR's nanotechnology workshops in Latin America and the Caribbean, funded by the UN (mainly the Swiss Government) and dedicated ''to offer support to governments and stakeholders to strengthen their institutional, technical, and legal infrastructure and capacities for sound management of chemicals".

The above clustering is complemented by two **case studies that do not receive national or EU funding**:

- the Dialogue Forum Nano of BASF, a practice launched by the German Chemistry Company BASF in the framework of their nanotechnologies R&D policy
- the NanoRESP Forum, a platform launched by a French NGO and funded by a multitude of stakeholders including industry, academia and NGOs.

Aligned to the Nano2All multi-stakeholder dialogue results, **all fifteen case studies also confirm the need for inclusiveness** (the involvement of society and their views) in the development of nanotech research and innovation development. The recommendations drawn from the interviews with experts even go beyond the field of nanotechnologies and suggest the creation of a European Network for RRI in **emerging technologies** (NBIC) to engage multiple stakeholders on a discussion on concrete situations (NanoRESP Forum).

At the same time, all fifteen case studies stress the **difficulty in engaging societal actors** to actively participate to dialogues. **Recommendations addressing the broader, active participation of different stakeholder groups to multi-actor dialogues** concerning RRI raise the importance of science education and awareness so that all societal actors can be included in an enabling dialogue (BASF Dialogue Forum, Dutch Societal Dialogue on nano). Involving participants at the earliest stage to avoid the development of strong positions (BASF Dialogue Forum) and choosing the appropriate participants depending on the topic (NanoTrust project) are deemed of equal importance.

Commitment to the process should be ensured through meticulous preparation and a means of financial compensation of stakeholders´ time and efforts. Making use of the appropriate communication channels to disseminate information and invite more independent actors or others who are aware of societal debates and are therefore able to represent societal views are also strongly recommended (Societal Incubator for nano /

Rathenau).

**The need for fostering constructive dialogue** is also addressed within the examined initiatives. In order for it to produce concrete results the constructive dialogue could be strengthened through communication based on scientific evidence and with the help of facilitators who are able to bridge the gap between scientists and lay people (BMBF Citizens meets experts). Small scale dialogues (i.e. focus groups or workshops) organised in such a way that everybody feels a commitment to the process but at the same time, everyone has the freedom to operate have proved to be more efficient. The process during those dialogues should combine the provision of information with activities focusing on opinion forming and exchange (Dutch societal dialogue on nano). The organisers should embrace the participants' diverse perspectives and goals putting, at the same time, the focus on the lessons to be learned, aiming not for a consensus but rather for different alternatives (NanoRESP Forum). For a successful implementation, the preparation, topics analysis, the planning and animation of the discussions should be assigned to skilled coordinators. Different speakers from the world of science should be solicited to share their expertise and shed light onto the different issues (NanoTrust project). At the same time, more informal moments of shared experience and conversational exchanges where participants can leave behind their traditional roles should be encouraged (Futurescape City Tours/ASU).

Overall, considering that public confidence in nanotechnologies is ultimately a function of the responsive capacities of the research and innovation system, the effective governance of nanotechnologies will require that **measures to incorporate different viewpoints are structurally embedded in decision making processes on nanotechnologies**. A **continuous platform on an EU level -** inspired by successful relevant initiatives in Member States (NanoRESP in France, NanoTRUST in Austria)[4] -, bringing together research, industrial, policy and societal actors, would enable mutual learning within the platform of what works and what doesn't, gathering expertise on effective governance mechanisms (H2020 NanoDiode).

**For the creation of such a sustainable continuous platform**, a great way to start is using the existing (from relevant initiatives) stakeholders' networks: interested people, with an open, transdisciplinary mind-set who are also willing to cooperate, should be involved from the start and they should be aspired to a common goal. The framework of this cooperation should be built upon **mutual respect**. Respect holds all other values such as democracy and social inclusion. A very important prerequisite for the success of the platform is **independence**: it should be provided by the initiator(s) of the endeavour. In this respect, a Research Institute would be a suitable initiator since it is free and independent by definition[5]. The **sustainability** of the platform could be safeguarded by **political will**, **sufficient financial resources** and a **mutual consensual procedure** (a formal statement of the rights and obligations of the platform members, agreed by all participants, stating also co-funding issues) that is considered crucial to the platform's smooth operation[6]. **Stability** would be secured by the establishment of a constructive communication based on trust and confidence which is built upon the involvement of the same (more or less) people over a period of at least 5 years in order to accompany and influence an innovation process.

[4] Nano2All, 2019

[5] André Gazsó, coordinator of the NanoTrust project and Chairman of the Austrian Nanotechnology Information Commission (Austrian Ministry of Health) (interviewed on 21 Feb 2019)

[6] Jean-Jacques Perrier, NanoRESP Forum coordinator, member of the NanoFutures working group (interviewed on 25 Feb 2019)

# 2. Best Practices Database

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NANO2ALL SOCIETAL ENGAGEMENT ON RESPONSIBLE NANOTECHNOLOGY

# Responsible nanotechnology R&I – Societal engagement practices

# Dialogforum Nano of BASF

## Introduction

**NANO2ALL** is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in our region.
RRI is an "*approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I*" [1] . As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

**This short report provides brief insights into the Dialogforum Nano of BASF, which comprised a series of face-to-face dialogue sessions on nanotechnology, initiated by the chemical company, BASF**. The description also touches upon how RRI is present within BASF and the motivations driving societal engagement. Finally, it presents BASF´s short recommendations on these aspects and points out existing needs for increased societal engagement practices in R&I. Data for this report was gathered via desk research and a structured interview with BASF Innovation & Technology Policy division.

[1] European Commission website: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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## Institutional anchor points of RRI at BASF

**BASF** (www.basf.com) is a large chemical company with 114,000 employees supplying nearly all sectors and almost every country in the world. Its broad portfolio ranges from chemicals, plastics, performance products and crop protection products to oil and gas. **BASF** has its headquarters in Germany and owns companies in more than 80 countries.

BASF is also involved in nanotechnology research and development which it applies in the development of new products. **BASF´s** customers for nanotechnology enabled products are intermediary organisations, such as cosmetic companies, plastics companies or paint producers, and thus it does not have a direct contact with consumers / final users.

**RRI is not a term used by BASF, as this terminology can be more linked to academic / political circles in Europe. The idea of RRI, however, is embedded in the company´s operation**, especially in BASF´s sustainability management and its research and stakeholder management. Stakeholder engagement for instance is manifested through BASF´s Stakeholder Advisory Panel at Board level. It also includes the many stakeholder engagement activities in the context of the company's political communication and sustainability management. In the context of R&I it can be linked to the concept of open innovation (a term related to RRI and more frequently used in industrial contexts).

The Creator Space™ program is an approach to bring stakeholders with different views together to develop jointly in a co-creation process a mutually valued outcome. The program was launched during BASF's 150th anniversary year in 2015. In around 50 initiatives around the globe, BASF employees discussed solutions to challenges with a focus on the three anniversary themes of food, smart energy and urban living with more than 6,000 partners from industry, academia, government and society. The key drivers of stakeholder engagement at BASF are sustainability and the need to best manage stakeholder expectations. This latter driver gained strength after the experience acquired in handling controversial topics, like the GMO public debate.

Sustainability is also part of the stage gate process. BASF's continuous analysis of the sustainability of its whole portfolio using the externally certified Sustainable Solution Steering® method and its Value-to-Society assessment deliver valuable information that **bring societal perspectives on board and that pay into the R&D of the company**. In fact, market assessment before and during the innovation and development phase in form of market reports also include stakeholder perspectives. This also applies to BASF's nanotechnology R&D. A diverse team of experts on toxicology, safety, analytics, regulation and communication is engaged world-wide with different stakeholders. One activity is its comprehensive engagement in safety research. Another activity is the Dialogforum Nano of BASF.

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## Societal engagement at BASF

In the context of the chemical industry, societal engagement has a long tradition, and BASF has been involved in this more than 20 years. BASF has undertaken a range of societal engagements on diverse topics, including sustainability, agriculture, nanotechnology, among other themes.


**The Dialogforum Nano of BASF started in 2006 and at that time the GMO debate was at its peak.** It was then when the European nanotechnology public debate was emerging. Recognising the potential of nanotechnology, as well as the failure of the previous risk debates, BASF decided to shape the debate on this new technology actively.

The Dialogforum Nano of BASF was focused on **establishing a dialogue with CSOs, including German and European non-governmental organisations (NGOs), trade unions, and churches**. The dialogues were not only led by BASF communication people but integrated a number of BASF staff with different expertise and different responsibilities including R&D. By that the stakeholder feedback was carried back widely in the company.

**One Dialogforum Nano of BASF consisted of a series of 4-5 face-to-face dialogues with 20-25 participants, accomplished over a period of 2 years**, with intermediate teleconferences and short visits to BASF research facilities.

The topics were identified with all participants together at the first dialogue. Along the dialogue process, mainly the 2 topics governance (discussing questions, such as whether voluntary commitments are suitable tools to govern such a technology) and transparency (discussing questions, such as who has to communicate with who and how to be more transparent) were discussed. Using specific application areas such as cosmetics or paints made the discussions more concrete. The toxicological aspects of nanomaterials were not debated in-depth as that would require higher expertise in toxicology aspects from the engaged participants.

Independent experts with knowledge on the addressed theme (for instance nanotechnology and environment) were also invited to contribute their views which helped to stimulate the debate and to further discuss each topic. The dialogues were organised and moderated by an independent moderator (external organisations experienced in the topic of nanotechnology and with expertise in conducting dialogues), contracted for the purpose. The participant list was drawn up jointly by BASF and the moderator organisation, while participants were mostly invited by the moderator. **The independent moderator was an important element of the dialogue**, and acted as a neutral and independent interface between BASF and the CSOs. The moderator also carried out bilateral interactions with the CSOs allowing that their requirements and claims are communicated and better considered within the process.

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The Dialogforum was open to all stakeholders, also critical ones. Those stakeholders were actively approached who were previously involved in the debate. Therefore, no empowerment prior to the events was necessary. The main outcomes of the dialogues were joint reports / positions addressing policymakers, companies and also other stakeholders. The reports were jointly published with all participants and presented and discussed with a wider group of stakeholders in political events in Berlin and Brussels. Most difficult was to find stakeholders who want to be engaged. **CSO representatives often mentioned the lack of resources as a reason for not being able to participate.**

The dialogue process brought interesting insights to BASF and it proved to be a unique experience for the company. It **raised additional awareness within the business units about the perspectives of stakeholders and also affected the way safety research was done.**

As for future stakeholder engagement, BASF is planning to focus on other topics that are more publicly debated at the moment. From the CSOs the company got the feedback that nanotechnology is not so high on their agenda for the time being.

## Recommendations and needs on societal engagement into nanotechnology R&I

BASF´s future recommendations for societal engagement into nanotechnology research and innovation include the following:

- Societal engagement in R&I is an optimal tool for mutual learning, building trust and transparency
- Societal engagement has to be though a continuous process to enhance its results, rather than a single event or sets of single events
- It is preferred to have a **continued dialogue with the same participants** to build on the relationship and to evolve previous conversations
- The participants for the societal engagement must be chosen depending on the topic
- It is most beneficial to **initiate dialogue at the earliest stage** of new emerging technologies so to avoid strong positions of stakeholders
- It is advisable to first **map internal expectations** within the organisations and management about such engagement and be aware of what can be achieved within the planned process
- It is more beneficial to have an **independent moderator** to provide an impartial interface which can also increase the likeliness of participation

The biggest challenge is to find enough and interested stakeholders for the dialogue. Further needs for a larger roll-out are organisations that offer services for implementing stakeholder engagement activities.

Another need is the creation of **communication channels** to disseminate information on such practices and experiences (the media might not be interested in this theme) that could motivate others to adopt similar strategies.

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# Responsible nanotechnology R&I – Societal engagement practices

# Societal Incubator for Nanotechnologies of the Rathenau Instituut

## Introduction

**NANO2ALL** is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in our region.

RRI is an "*approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I*"[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal/formal meetings, or other formats.

**This short report provides brief insights into the Societal Incubator for Nanotechnologies initiative of the Rathenau Instituut, which comprised the development of the concept and a short experimentation of it**[2]. The description also touches upon the benefits and objectives of developing a societal incubator. Finally, it presents the structure and operationalisation of the societal incubator as well as findings and recommendations. Data for this report was gathered via desk research and a structured interview with Dirk Stemerding, a former Senior Researcher of the Rathenau Instituut.

[1] European Commission website: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

[2] https://www.rathenau.nl/en/knowledge-policy/beyond-public-acceptance

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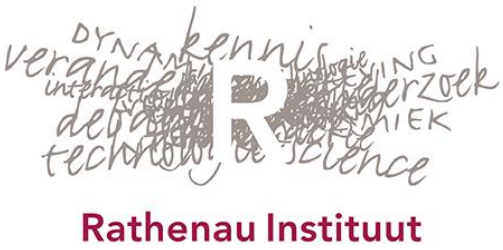
# Rathenau Instituut and the Societal Incubator concept

**Rathenau Instituut** (https://www.rathenau.nl/en) is an independent technology assessment organisation based in the Netherlands. The institute stimulates public and political opinion on social aspects of science and technology. To do so, it conducts research and organises debates relating to science, innovation and new technologies.




**Rathenau Instituut took up nanotechnology as an important issue to address around 10 years ago** when the Dutch government started to support the development of this technology on a programme basis. One of the elements of the national programme on nanotechnology was technology assessment in which Rathenau Instituut played an important role. Another key priority of the programme was linked to nanotechnology valorisation and the stimulation of the commercial application of the technology and of new economic activities and start-ups that may emerge from the development of nanotechnology. Linked to these programme elements, Rathenau Instituut **was requested to explore the societal incubator concept (**original concept / idea was conceived beforehand[3]) **for nanotechnologies (design the concept and experiment it) in 2015**.

**The societal incubator concept came as a possible solution to deal with the controversiality surrounding nanotechnology**. While nanotechnology can help address major societal challenges, in practice, several uncertainties linked to the new developments (for instance health and safety risks, environmental problems, and socio-ethical matters) as well as consequent "waiting games" (companies wait for others, and for particular signs of others to move on with further developing a particular innovation) have become an obstacle to commercialisation and to fully taking advantage of the potential offered by nanotechnology. In such a complex scenario, collective actions and learning processes may be needed to overcome uncertainties. **The societal incubator could be framed as platform / institution that offers the opportunity to organise a collective action or learning process to accelerate responsible innovation and increase the chances of social success of nanotechnology. The societal incubator can serve two different but related purposes.** It serves the interest of innovators who have an idea of a particular innovation and recognise the surrounding uncertainties that may negatively influence its societal acceptance. On the other hand, the societal incubator may also offer a particular opportunity to bring together different stakeholders around specific issues such as societal matters, environmental problems, health issues, etc related to nanotechnology in a broader context rather than with a focus on a particular innovation.

[3] See: Harro van Lente (2015) "The societal incubator as a solution to waiting games in emerging technologies". In: Bowman, D.M., A. Dijkstra, C. Fautz, J. Guivant, K. Konrad, H. van Lente, & S. Woll (eds.) *Practices of Innovation and Responsibility. Insights from Methods, Governance and Action*. Berlin: AKA, pp. 43-52.

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**The societal incubator can be operationalised in three crucial steps**: (I) collection of information and organisation of interaction, (II) analysis and (III) deciding whether to continue the development trajectory or bring it to a halt. These steps are important to enable collective and social learning, on all possible outcomes, on the significance, and the implications of technological innovations. The societal incubator's process is shown in Figure 1

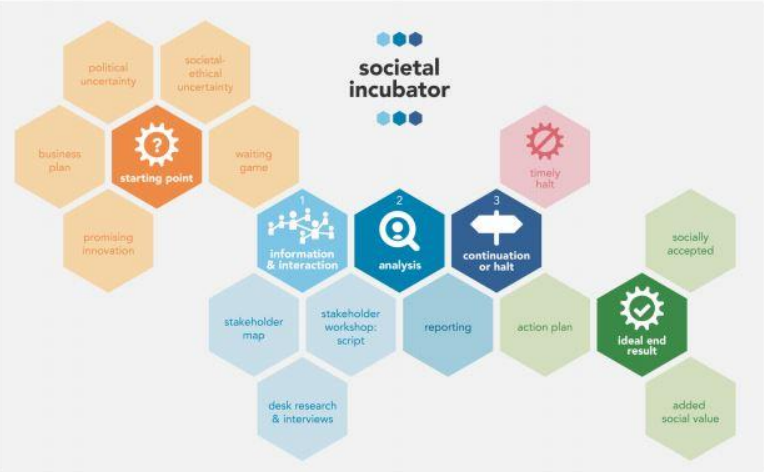


*Figure 1: Societal Incubator Process*

Source: Rathenau Instituut[4]

**Step I is a combination of desk research, interviews and interaction** in ideal cases**.** The information phase consists of stakeholder mapping and a literature study to understand the possible stakeholder views about comparable technological innovations. This should be completed with interviews to fill remaining knowledge gaps. The interaction phase consists of the organisation of interactive workshops that bring together the technology developer and different stakeholders, including producers, academicians, regulators, policymakers, and consumers, to have a more in-depth discussion on a particular innovation. This step is relevant to exchange views, enhance mutual learning and understanding, and build trust.

**Step II** is a follow-up of Step I and ends in a report that is sent to all participants of the interaction process. It **provides an analysis of the information gathered**, including stakeholder views on societal needs, socio-ethical acceptability, and (risk) regulation.

Finally, **Step III** is a decision step in which the technology developer, based on the results of the previous steps and the knowledge and understanding he/she gathered, **takes a decision on whether or not to continue with the technology development.** If he / she decides to continue the development, the analysis can serve as guidelines to achieve a socially accepted product with added social value. The analysis report can identify important aspects, such as for instance potential conditions to be met or alternative design choices. In the case that the technology developer decides not to continue with the product's development, the analysis is able to provide timely and informed decision which minimises any potential financial damage.

## Societal Incubator experiment

With a view to prove the viability of the societal incubator, an experiment was conducted focusing on Step I of concept. **The experiment tested an imagined nano-enabled innovation that allows to combat iron deficiency in young females**. Nanotechnology can encapsulate iron in a way that it does not affect taste and thus it can be added to food, for instance to chocolate. Encapsulation can be done in such a way that there's no health risk whatsoever. Nanotechnology in food was chosen as a target application area as there is strong conviction that nanotechnology has a lot to offer here. However, this is also a controversial area and firms have been reluctant to take up nanotechnology in their portfolio due to the fear for how the public would respond to it.

[4] Page 11: https://www.rathenau.nl/sites/default/files/2018-07/Beyond%20Public%20Acceptance_1.pdf

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**The experiment limited itself to the interaction phase by organising a workshop bringing together relevant stakeholders to discuss this particular innovation**. Ideally, this event should have been preceded by an investigative process of desk-research and interviews, but within the time constraints of this experiment it was not possible to properly meet these conditions. Nevertheless, some participants were interviewed before being invited to attend the workshop in order to ensure that they had the same level of conversation and understanding of the topic discussed in the workshop. The participants included a technology developer from the nanotechnology field (who acted as the owner of the particular innovation), as well as representatives from consumer organisations, regulatory agencies, also others more related to innovation policy making, science and technology studies and similar fields. The engagement of civil society though turned out to be difficult. This might be due to lack of time and interest in the topic / workshop outcomes. **The workshop followed the pre-designed script**, available in the report of the societal incubator concept[5]. This consisted of the following **major blocks**:

| | |
|---|---|
| Welcoming the participants | Prioritising of uncertainties & points of interest |
| Introduction round | Further discussion of dominant uncertainties & bottlenecks |
| Business Case introduction | Broadening of the discussion |
| Societal Context | Lessons learned and options for action |
| First reactions | Closing |

## Societal Incubator Experiment's Findings

- Based on the experiment conducted, the consulted stakeholders in the workshop recognized the existence of the waiting game and positively received the idea of a social incubator. The stakeholders concluded that a social incubator could help technology developers to **gain more insight into the nature of waiting games, reduce the associated uncertainties, and better estimate their own chances** of success.

- An important point is that **the innovator should be the owner of the societal incubator process**. The incubation process might help to take a particular decision on how to proceed with the innovation, however, the decision should be taken by the innovator her-/himself. In addition, the process should be organised in such a way that everybody feels a commitment to the process but at the same time, everyone has the freedom to operate, especially the innovator.

- A key element of this process is **the diversity of people to bring around the table** in order to think about the particular idea of innovation. This adds to the richness of the discussion and allows for a variety of perspectives to emerge.

- In order to engage stakeholders in the societal incubation process, **having the commitment from the stakeholders,** including civil society organisation who are active around particular innovation issues is important. **Financial compensation** of stakeholders´ time & efforts can be one option to facilitate engagement. Regarding the reluctance of civil society to participate in the societal incubator interactions, a solution may be **inviting more independent actors, for instance journalists** or others

[5] Pages 11-13: https://www.rathenau.nl/sites/default/files/2018-07/Beyond%20Public%20Acceptance_1.pdf

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who are aware of societal debates and, therefore, can represent societal views. On the other hand, to increase their commitment, **the industrial sector could also be a financer / co-financer of societal incubators** which costs could be included in their already existing research and development investment. Related to this, the public-private partnership model could also be explored.

- **Business incubators could act as a platform for the societal incubator**, as these concepts are complementary and are related to support to businesses / start-ups. To take up this role, business incubators, however, need to acquire specific expertise allowing more understanding of complex interactions and knowledge in the field of social embedding issues.

- **The societal incubator could also be used on a more programmatic basis**, rather than just a platform to discuss particular cases of innovation. Within the societal incubator stakeholders could regularly explore technological innovation trajectories with a focus on solving urgent societal challenges. This would enable a collective learning process and could also help avoid waiting games.

The societal incubator concept is, indeed, strongly related to core questions raised by NANO2ALL, including the type of actions and interactions needed to better identify and integrate societal needs, concerns and values in nanotech R&I processes. The societal incubator concept proposes procedures that can be put in place to understand societal perspectives in regard of nanotechnology R&I and can be set up especially in the applied research and product development phases. It can also be used as a space for structural interaction and exchange of views between stakeholders, enhancing their mutual understanding. These features are also in line with some of the nanotechnology RRI related recommendations and needs identified by stakeholders in NANO2ALL (for more, please see the reports “Responsible Innovation Agendas at National Level” and “Responsible Innovation Agenda at European level” at www.nano2all.eu/resources).

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Technology of imagination: a card-based public engagement method for debating emerging technologies

# How do citizens form their opinions on emerging technologies?

## Introduction

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**This short overview of a scientific paper provides practical insights into the design of IMAGINE, a qualitative research method that also aims to encourage societal engagement with science and emerging technologies** (Felt, Schumann, Schwarz & Strassnig, 2014). The overview was validated through a short phone interview with Dr. Claudia Schwarz-Plaschg from the University of Vienna, one of the authors of the scientific paper.
Drawing on concepts from Science and Technology Studies, the authors discuss the method's structure as well as how citizens in the four discussion groups appropriate the setting. The cards' tangibility and their content organise the discussion choreography to move between individual and collective positioning. This choreography presents a **Technology of Imagination** which contributes to citizens' capacity-building in developing broader

[1] European Commission website: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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imaginations in relation to potential developments of emerging technologies in a specific context. Finally, the review finishes with brief recommendations on the aspects of applying this research method and the implications of its limitations.

## IMAGINE NANO in Austrian context

IMAGINE is a qualitative research method, created from a learning need on how to facilitate the development of citizens' imaginations on NANO (Nano Science and Nanotechnologies). It was developed with the purpose to be validated as tool for qualitative research on societal engagement in emerging technologies (e.g. nanotechnologies) and applied in the Austrian context with 24 participants between November 2009 and January 2010. **The discussion format was a public engagement consisting of 4 thematic workshops, each with a maximum of 6 participants, who spent 4 hours together, with the support of a moderator, debating NANO in the field of medicine, food, information and communication technologies (ICTs), and consumer products** (each workshop focused on one of these fields). The method allows to gain a better understanding of how citizens form their opinions on emerging technologies and this can in turn contribute valuable insights for research and policymaking. **The selection of participants was directly based on gathering profiles with diverse positions and social backgrounds to form "mini-publics"** (Goodin and Dryzek, 2006), thus, including everyone interested in discussing the topic— not discriminating already engaged citizens and the ones that have a strong opinion on NANO. The authors claim that they opted for heterogeneously mixed groups of diverse genders, ages, educational and professional backgrounds in order to observe and document individual critical thinking and the (re)shaping of opinions due to an influence of other participants' views. The call for participation was disseminated through flyers delivered to households in Vienna, and distributed at science museums and science events in Vienna, Austria.

**The Austrian context is of a peculiar nature, due to culturally firmly established hierarchies between citizens and experts in which the public rarely challenges experts in physical encounters** (Felt et al., 2009). Conversely, the chosen method created a space in which criticism of expertise and expert opinions became possible. In addition, Felt and her colleagues (2014) address **NANO as an S&T area in which it is difficult to find a right moment for intervention** since the nano-products are both downstream and upstream products in the innovation process — meaning that a range of nano-enabled products are already on the market, and at the same time many of them are still "future technologies" (visionary products) in a wide range of domains.

In general, card-based methods have been shown to work well **when the employed tool represents a good structure to initiate talk about sensitive issues** (see Chang et al., 2005; Sutton, 2011) **and in reflective exercises to analyse people's approach to ordering and classification** (see Bloor et al., 2001; Kitzinger, 1994).
Thus, Felt and her colleagues claim that the cards facilitate engagement since the participants **"use their embodied skills from playing games, which include bodily performances, know-how (of rules) and interpretations (e.g. of the other players' behaviour)."** (p. 237)

## Societal engagement through IMAGINE

The scientific paper explains in detail the whole process of selection, integration, facilitation and moderation of a public debate in the format that was aforementioned. Through this methodology, participants were guided through a step by step learning and reflection process.

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Firstly, an introductory video and **story cards** supported demystifying new terminologies, questioning and clearing ideas. The experts' visions and opinions were duly incorporated in the story cards' content. The **function of the cards was mediated via their interpretative flexibility and ability to impersonate human actors and their positions.** Secondly, **application cards** spoke about contemporary nano-products applications and thirdly, **issue cards** leveraged potential risks and problems in the NANO field (i.e. ethics). In the final stage, **future cards** stimulated participants' imagination of how nanotechnology and society might or should co-evolve in the future. T**he authors also stress that the participants were not asked to reach consensus throughout the debate in order to be able to keep the diversity of opinions and the richness of discussion.** In addition, the process of card selection by citizens seemed to be guided by the following motives: i) either connecting a card with a pre-existing personal agenda or ii) balancing different cards, both of positive and negative aspects. The biggest difficulty for the citizens was imagining and questioning issues that are distant from their daily reality, even when considered interesting or pertinent to be discussed.

Moreover, **the capacity-building of individual/collective was an ongoing process that contributed to creating possible future scenarios when considering sociotechnical developments**. The authors claim that participants became more comfortable with narrative building through expression and imagination.

## Recommendations and needs for sustainable societal engagement with NANO through IMAGINE

The authors particularly recommend applying the IMAGINE method for societal engagement when there is a need for forming a public opinion about a subject-matter in research and innovation, having in consideration that the method:

- May be applied to a variety of broad or specific topics (i.e. issues that are publicly polarized) when societal engagement is a desired process and an outcome is required that reflects public opinion on a subject-matter;
- Provides an appropriate framework to treat everyone in an equal and equitable way, providing a sufficiently flexible structure and content for individual self-capacitation to be able to form an opinion in discussion with others;
- May need a follow-up activity for a more clear and precise insight to evaluate any potentially occurred social impact (e.g. conduct interviews with individuals who participated in the workshops and see how possibly their approach changed to the subject-matter);
- Needs a moderator who only facilitates a dialogue among participants, without imposing one's expertise (in case of existing capacity);
- Might benefit from a video recording of the workshops to capture non-verbal practices of handling cards (decision-making processes);
- May trigger further discussion if questioning about non-chosen cards;
- Can provide experts' insights in a non-imposing way and materialize them through cards.

To conclude, **this is not a ready-made template that can be easily incorporated from one national or cultural context to another**. In order to utilize the IMAGINE method, it is necessary to adapt it to the new experiences, cultural contexts and needs of the specific topic to be discussed.

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Source: NanoRESP

# Responsible nanotechnology R&I – Societal engagement practices

# NanoRESP

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**This short report provides brief insights into the NanoRESP Forum,** a multi-actor dialogue forum fostering practices of responsible innovation. Data for this report was gathered via desk research and a structured interview with Dorothée Browaeys, founder and coordinator of NanoRESP.

[1] European Commission website: https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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## The NanoRESP Forum

The NanoRESP Forum [2] is **a multi-actor dialogue forum fostering practices of responsible** (relevant and sustainable) **innovation**, designed to explore responsible innovation for nanotechnology-based industries. It was created in France in 2013 inspired by the CNAM Nanoforum initiative[3]. Right from the start, the NanoRESP Forum was aimed at contributing to a shared social vigilance and an exchange of experience, being less of a public debate and more of a stakeholders' dialogue to foster RRI in the field of nanotechnologies.

NanoRESP's top objective is **to promote an open, non-confrontational albeit critical stakeholder dialogue on nanotechnologies and nanomaterials**. The idea behind such initiative is that discussing the uses, risks and benefits of nanoproducts and their alternatives will **empower participants in the exercise of their respective responsibilities**.

Four times a year, producers, distributors, users and consumers of nanoproducts are invited to share knowledge, initiatives, concerns and expectations at NanoRESP Forums. **Since 2013, 16 forums have attracted more than 500 participants** from industry, citizen's associations, academia and policy-making circles. **Topics addressed** spanned the properties of commercial nanoproducts, their release in the environment, lifecycles, ecotoxicology, definition of nanoparticles, regulations etc.

**NanoRESP Forum is sponsored by the NanoRESP alliance**[4], which includes the Chemistry Company BASF (French subsidiary), French electricity company EDF, car manufacturer Renault Group, tire and mobility company MICHELIN Group, French Hydraulic Binders Industry Technical Association (ATILH), Public Works Insurance Group (SMA BTP), the national metrology laboratory of France (LNE), AgroMousquetaires (food producer and distributor) and the French Occupational Hygienists Society (SOFHYT). The NanoRESP alliance delegates the organization and coordination of the Forum to the company TEK4life[5]. The latter is supervised by a Steering Committee [6] composed of academics, citizens, industry managers, journalists and NGOs. The NanoForum initiative receives no public funding. However, it is supported by EpE[7], the association hosting the Alliance and the Steering Committee's meetings.

## How does it work?

**Since 2013, twelve topics[8], spanning the value chain, were successively addressed**. For each of them a number (3 to 5) of different speakers were solicited to share their expertise and shed light onto the different issues while 40 to 50 participants – researchers, consultants, industrial federations' representatives, associations, journalists etc - were brought together.

[2] www.nanoresp.fr

[3] A forum initiated by the National Conservatory of Arts and Crafts (CNAM) which, during 2006 and 2007, hosted a series of 11 stakeholder dialogues on nanotechnologies. It

4 The full alliance at http://www.nanoresp.fr/lalliance-des-financeurs/

[5] Company found by Dorothée Browaeys with a mission to align innovation strategies to the socioeconomic transition and to develop several platforms for stakeholders' dialogues. Dorothée Browaeys and Jean-Jacques Perrier are coordinating the NanoRESP forum.

[6] The full Steering Committee at http://www.nanoresp.fr/le-comite-de-pilotage/

[7] 'Entreprises pour l'Environnement', created in 1992, is an association of around forty French and international large companies from all sectors of the economy, who want to make environmental considerations more a part of both their long-term planning and their day-to-day management. EpE gives its members a forum for discussion, within the business world itself, but also with NGOs, ministers, politicians, scientists and academics.

[8] Traceability, habitat, users' awareness, quality assurance of nanoproducts, nanosilver, food, water, self-cleaning & purification, automobile industry, energy transition, toxicity evaluation, nanomedicine

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**Each four-hour meeting is meticulously prepared** by addressing all issues to be examined thus creating a common thread which is announced at the beginning of the meeting. This common thread is usually coupled with a factsheet destined to update participants on the state of play of the issues addressed, the positions, needs, expectations and concerns of the actors involved. Detailed reports of all meetings are uploaded on the website[9].

The Forum mainly addresses the national level although the participants come from all over Europe. The **low turnout of the civil society** reported is allegedly **due to the complexity of the topics addressed**: There are issues of general interest gathering representatives of the wider public while there are others (i.e. graphene) the specificity of which does not favour the public's engagement. **The Government is also moderately represented in the Forum procedures** with the participation of agencies such as the Directorate General for Enterprise of the Ministry for the Economy and Finance Affairs or the Ministry for the ecological and inclusive transition and the French Agency for Food, Environmental and Occupational Health & Safety (Anses).

Source: NanoRESP

Up to date, the stakeholder's interaction and exchange of experience during the different sessions produced the development of **four main axes to be further deliberated**: 1. Nanoparticles characterisation – what are the challenges? 2. Nanomaterials use – how to prioritize their utility and address the risks at the same time? 3. Life cycle analysis to achieve "safety by design" and 4. How to use the existing information databases in order to raise awareness?

## Keys to success

The initiative's success is partly due to the **multitude of different stakeholders brought together in mutual respect, in a transparent, democratic and socially inclusive framework**. From the steering committee to the participants of each session, this multi-stakeholder initiative embraces a diversity of partners: industry, academia, civil society organisations, producers and consumers. All the above participants do not share the same goals and interests. However, they find out that there are lessons to be learned through the exchange of experience with stakeholders they would hardly get in touch with, without the forum's platform.

In this context, **different competences, skills and expertise create the dynamics for constructive dialogue** which gradually turns into a learning process where participants learn from each other in a spirit of long-term commitment, helping to create trust.

In the spirit of RRI policy of the EC, NanoRESP forum encourages innovation practices that take into account a developed product's full life-cycle, its potential uses/misuses and the social utility/futility of the product. It seeks to promote anticipation, reflexivity, inclusion and responsibility. In this respect, **controversies are viewed as opportunities to foster new innovation strategies and increase the robustness of industrial projects, rather than as obstacles**.

[9] http://www.nanoresp.fr/comptes-rendus/

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The forum evolves through continuous re-evaluation of the practices applied and the approaches taken. It may also be regarded as a platform for policy-making since it brings together different stakeholders embracing their diverse perspectives and goals, promoting thus a public space of openness and social responsibility.

As a result, a parliamentary structure participated, for the first time in NanoRESP latest meeting (June 2018): the Parliamentary Office for Scientific and Technological Assessment (OPECST) [10] which acts as an intermediary between the political world and the world of research. NanoRESP is originally a citizen initiative (by having been launched by an NGO[11] ) encouraged by public authorities and being such, it creates the right dynamics to foster a democratic dialogue and at the same time, to empower participants to exercise their respective responsibilities.

Stakeholders from the industry world such as the Italian cement producer Italcimenti, chemistry company BASF or tires company Michelin have capitalised on the NanoRESP experience either by launching a local dialogue process or by further exploring the Forum results in their company's framework, including research processes.

Source: NanoRESP

## Steps towards the future

Emerging technologies are problematic because of the persistent uncertainty that surrounds potential risks. This uncertainty—about whether, in what form and to what extent risks exist—makes it difficult, and often impossible, to apply routine decision-making procedures for risk assessment and management[12].

The effort to regulate nanotechnologies has created a learning ground to observe the way we operate within that uncertainty and thus to re-evaluate our methods: for example broad public debates usually have a rather polarizing effect andsthus, may no be longer suitable for addressing this kind of issues; bilateral arrangements – such as a consultancy firm appointed by a company of the industrial sector to provide answers to questionings/issues on nano – are not pertinent either. A more functional way to address RRI is to **engage multiple stakeholders in a discussion on**

[10] OPECST aims to inform the French Parliament of scientific and technological options in order, specifically, to make its decisions clear." Regarding this, OPECST "collects information, launches study programmes and carries out assessments.". OPECST acts as an intermediary between the political world and the world of research.

[11] Vivagora: Paris-based French NGO founded in 2003. Until 2013 Vivagora organized large public debates on social issues related to scientific and technological developments.

[12] R. Falkner and N. Jaspers, 2012: "Regulating Nanotechnologies: Risk, Uncertainty and the Global Governance Gap", Published in: Global Environmental Politics, 12(1), pp. 30-55

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**concrete situations** regarding nanotechnologies (or any emerging technology). Stakeholders should be guided to substantially consider their practices regarding nano and to examine different alternatives by focusing on real, existing cases derived from industry or the society. Those cases should be introduced, taking in consideration the stakeholders involved and the challenges faced, in a way to motivate solution-finding via collective thinking. For this reason, **platforms fostering awareness and dialogue should be created in national but also in international level**. In this framework, the NanoRESP team expresses a **strong will to reach out to other national or EU initiatives and share this very particular experience** of a forum financed by the industry but steered by a pluralistic scheme of stakeholders, with a vision to **create a European network for RRI**.

At the same time, **NanoRESP concept is already evolving to address future needs towards the development of converging technologies** in four core fields: Nanotechnology, Biotechnology, Information technology, and Cognitive science (NBIC). The idea is **to create a muti-stakeholder dialogue forum as a facilitator of the transition in all production patterns**. NanoRESP has born its fruit: BioRESP[13], which is already in place and running to guide us through bio-economic transition and DigiRESP, planned to address responsible research and innovation in the digital industry.

[13] http://bioresp.eu/

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Source: Nanoinformation.at

# Responsible nanotechnology R&I – Societal engagement practices

# NanoTrust

## Introduction

**NANO2ALL** is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in Europe.

RRI is an approach that anticipates and assesses potential implications and societal expectations, with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations, consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the nanosafety project **NanoTrust**. Data for this report were gathered via desk research[2] as well as through an interview with André Gazsó, coordinator of the NanoTrust project and Chairman of the Austrian Nanotechnology Information Commission (Austrian Ministry of Health).

## NanoTrust scope & development

NanoTrust is a Technology Assessment project carried out by the Institute of Technology Assessment of the Austrian Academy of Sciences. It is dedicated to assist policy-makers in issues surrounding the safety of nano applications. Its aim is to support the establishment and maintenance of a governance network and to take a more active role in contributing to pre-emptive risk management and the initiation of new governance processes – especially in risk and safety assessment and management.

It was established in 2007, following the Austrian Nanotechnology research program, "NANOinitiative" of 2003, as a consequence of the need to have a profound research activity on nano risk governance issues. NanoTrust was originally coordinated and funded by the Ministry of Transportation, Innovation and Technology (BMVIT),

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

[2] Gaszo, A., Fuchs, D. Nano Risk Governance: extending the limits of regulatory approaches through expert dialogues Rose, G., Technological Forecasting & Social Change (2018), https://doi.org/10.1016/j.techfore.2018.06.024

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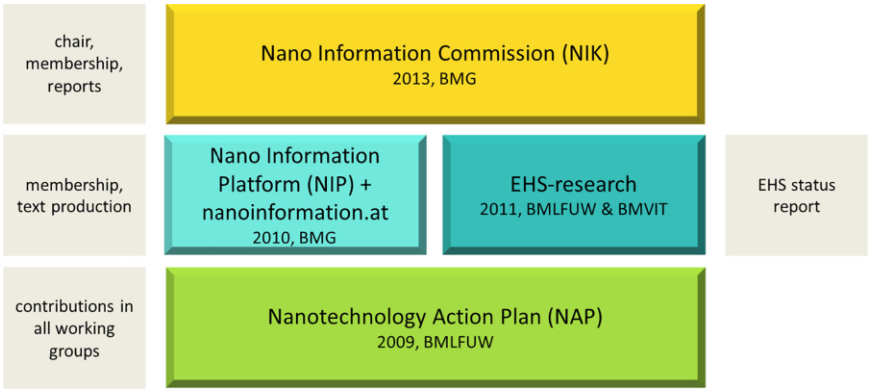
with the idea to serve as an interpreter of scientific findings – provided that they are concerned with safety issues – for all sorts of recipients (e.g., scientists, science journalists, public authorities, and the interested public). The foremost task was **to identify research and regulatory deficits and to provide reliable information on safety and risk-relevant topics**. NanoTrust fulfilled that task through the formulation of **a community of stakeholders** interested in safety and risk and at the same time, through the production of a body of reliable, sound knowledge on safety and risk issues. Soon the project's initial character evolved due to the interest and implication of several ministries, safety agencies, and research institutions, its new task being the formulation of a **national Nano Action Plan for Austria (NAP)**. NanoTrust would provide the knowledge base for political decision embedded in the Action Plan and would engage relevant stakeholders in the working groups which led to NAP's creation. Four different NAP working groups, consisting of around ten people each, were dedicated to the following topics: health and worker safety, environment, economy and research and development.

Those working groups, bringing together stakeholders from various organisations[3] were open to whomever interested and met regularly over the course of approximately 12 months with multiple NGOs being initially present but most of them eventually withdrawing from the process. The reasons of that withdrawal, as speculated by the NanoTrust members, is that i) those meetings were too resource – intensive for a long-term commitment, ii) the NGOs wished to stay independent avoiding thus the active participation/contribution to a network serving the aims of public administration. Nevertheless, the working groups were still accessible for all interested parties and all documents were publicly available.

**The contribution of NanoTrust in the Austrian nano risk governance landscape**




Source: G. Rose, A. Gazsó

In autumn 2009, the document was published for public consultation. The remarks were collected and integrated by the Ministry of Environment and the NAP was finally adopted by the Council of Ministers in 2010 being since then an official guidance document to the Austrian Nanotechnology policy. Within NAP, NanoTrust is named as an existing structure to serve as a technical pillar of a communication platform between **policymakers, ministries and social partners**. The project has since been extended several times, having developed into **an organisational process embedded in the regulatory system**, its role having expanded to include the tasks of **initiating joint activities**, **coordinating and eliciting discussions** and **jointly organizing the generation of new knowledge concerning subjects with relevance to risk and safety**. Those roles are continuously re-examined given the ever-changing regulatory situation of the Austrian nano risk governance landscape.

[3] ...including Representatives of the Austrian Ministry of Environment (BMLFUW) and of several other federal ministries and authorities (science - BMWF, technology and innovation - BMVIT,
social affairs including worker protection - BMASK, and health - BMG), the Austrian Environmental Agency,
the Chambers of Commerce (WKO and Labor AK), and the Austrian Food Safety Agency (AGES), the University of Vienna, the University of Agriculture, the Austrian Academy of Sciences and others

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One of the concrete outputs of the NAP was the foundation of a **Nano Information Platform (NIP)** aiming to bring together experts from a wide variety of fields to establish transparent public communication on the safe use of nanomaterials. The NIP is a non-formalised, open (people participate on a voluntary basis and they are free to come and go whenever they want) yet stable (as in the sense of committed people who participate from the onset) group of around 10 – 12 stakeholder representatives (ministries, safety agencies, NGOs and research organisations), coordinated by the Ministry of Health. NanoTrust has taken part in this public communication network from its very beginning in 2010.

The result of these NIP expert discussions was the establishment of a **nano-information portal** (*nanoinformation.at*), hosted by the Austrian Ministry of Health yet being a common project of all the concerned ministries[4] and other organisations such as the Austrian Academy of Sciences and Austrian Food Safety Agency. Since 2012, it **ensures transparent public communication on the safe use of nanomaterials** through a continuous information flow between experts and the interested public. It gives people the option to interact with regulatory authorities and experts in case there are questions and concerns. Consumers' questions are collected through the portal and answered within a 2-week timeframe after establishing an intercommunication process among collaborating experts. Material for this public information platform is developed in **different self-organized working groups**. A stable working group on worker safety was established in June 2011, under the responsibility of the Austrian Worker Compensation Board "AUVA", the biggest[5] insurance company for work places in Austria. NanoTrust has initially suggested to install such a permanent working group and has since then been part of it and regularly takes part in their meetings until today. The nano – information portal establishes **a two-way communication process** by i) producing nano safety and risk relevant info addressing the interested public and ii) answering the consumers' questions. The NIP has been active since 2010, convening 2 or 3 times per year, being responsible up to date for the following tasks: operation and maintenance of the portal, public communication (consumers and the interested public), publication of risk and safety relevant documents produced by its members for use on the portal.

NanoTrust has been especially involved, from the onset, in the creation of the **Nano Information Commission (NIK)** of the Austrian Ministry of Health which represents the most formalised element of the Austrian nano risk governance landscape. The NIK was founded in 2013[6] as an advisory board to the Minister of Health. It consists of 23 members from ministries, agencies, universities as well as two NGOs. It convenes two to three times a year having as main tasks i) to provide all members with information on the current research and developments in the field of nanotechnology safety, ii) to offer an opportunity to discuss and evaluate these findings and iii) to foster safety-relevant research concerning the use of nanomaterials in Austria. **The NIK is concerned with the implementation of the Austrian Nano Action Plan and represents the diversity of opinions and the professionally sound state-of-knowledge of various scientific experts**. In contrast to the NIP, the NIK is not an open network: Proposals for new members can be made by the plenum. ITA designates one full membership and a substitute to the NIK. The chair is hosted for 5 years and currently held by the Coordinator of the NanoTrust project.

## The societal engagement in NanoTrust governance network

From the different working groups having led to the creation of the National Action Plan, to the Nano-Information Platform (NIP), the Nano-Information Commission (NIK) and the various working groups formed to work on specific subjects on safety and risk in nano, NanoTrust has decidedly contributed to building a

[4] Ministries of Health, Environment, Technology, Science, and Social affairs

[5] 4.3 million insured people

[6] according to §8 of the Austrian Federal Ministry Act

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functional **governance network** reflected in all those platforms, commissions and working groups described above. Currently, the NanoTrust project, in collaboration with stakeholders of this governance network, holds four **different modes of events** i) **scientific conferences** on nanosafety topics: events which are open for the interested public and stakeholders to attend, such as the NanoTrust annual conference held since 2007 at the Austrian Academy of Sciences or conferences in collaboration with other organisations (such as the Ministry of Health).ii) **informational events**, open events partly organised in cooperation with a ministry or other involved organisation (i.e. information evening on food safety and regulatory issues co-organised with the responsible ministries), iii) **ad hoc expert dialogues** on specific safety topics held on an invitation-only small group of people, (i.e. nano-regulation related questions addressed to experts in the context of controversial discussions such as nano waste), iv) **round-table events**: invitation-only events, with 5–20 participants, dedicated to specific tasks and questions. For instance: deliberations on topical subjects such as current trends in safety research or strategic meetings aiming mainly to prepare structured knowledge for decision-making purposes (i.e. shaping the next Austrian EHS research programme). Those events are initiated and co-funded by NanoTrust. One could also add to the above **the ongoing question/answer dialogue of the nano-information portal** which gives to laymen the opportunity of interaction with regulatory authorities and experts.

Through the governance network and those different types of events, NanoTrust maintains a community mainly comprised by academics, consumer organizations and representatives of various Ministries and Agencies (Austrian Food Agency, Austrian Environmental Agency). The industrial perspective is also incorporated through umbrella organizations[7]. It was consciously decided not to make special attempts to attract specific industries because the project focuses on common overarching goals and not particular individual interests. NGOs have been explicitly invited to participate, several times; while eager to contribute to the discussion process in the beginning, few of them merely made sporadic appearances during past events. Many of them left the working and implementation process and did not further contribute to the production of information material. Still, two of them are members of the NIK.

The project design does not include direct participation of the general public, this of course not reflecting a lacking need for or importance of participatory public discussions and engagement on the subject of nanotechnology. This is rather a result from the project design, methods and available resources: The different dialogue structures used within the project perform on a voluntary basis. Therefore, citizens and NGOs (with restricted resources) find it difficult to commit to providing time and effort in order to regularly follow the agenda of those groups. That said the sporadic participation of NGOs or citizens is not excluded. Over and above, one could argue that instead of addressing the broad public, the project focuses on attracting the interested citizens, in the sense of professional, educational or other interest which implies a prior minimum knowledge of the subject. This knowledge is open and accessible to the broad public through the information provided in different NanoTrust publications available online[8]. Another step towards the broad public though is the use of a public authority's premises (e.g. conference room in a Ministry building) in lieu of the Institute of Technology Assessment for the various meetings/events. Whilst the latter usually calls for strictly scientific public the former stresses the character of public interest and therefore more people are likely to attend.

## Project findings & recommendations

NanoTrust is more of a continuous accompanying process than a classic research project, this being a necessity born out of the need to develop a consultation process capable of addressing a moving target, seeing as the

[7] ...such as the Austrian Federal Economic Chamber (WKÖ), which represents Austrian businesses, and the Association of the Austrian Chemical Industry (FCIO), representing Austrian companies manufacturing chemical products on an industrial basis

[8] The project offers on an irregular basis "Dossiers", approximately three to six page summaries of the state of knowledge on current issues in the existing nano debate in an accessible language, but on a firm scientific base. The NanoTrust Dossiers are published in German and English language and can be visited at EPUB.OEAW.

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technology matures and the regulatory situation changes over time. Initiating and maintaining a project like this requires a **common understanding between the main actors** concerning fundamental targets. The project has devoted its resources to **defining and realizing common goals**, such as the formulation of the Nano Action Plan, the creation of the NIP etc. The focus being placed on those overarching goals, the project avoids making individual interests (or their harmonisation) the main topic of discussion, circumventing thus the risk of paralysing conflicts.

**Stability and trust** built among the actors of the Austrian nano risk landscape – in the sense that the relationship between participants tends to be intimate and personal - need to be treated as the project's most important assets, as they are what enables the kind of dialogues required for the constructive and cooperative space that NanoTrust wishes to maintain. At the same time, the project tries to maintain a **continuous introduction of new actors** to help counteract the homogenization of ideas and viewpoints throughout time.

Finally, **incorporating a systematic reflection** of the process and **seeking input from other perspectives** (feedback from cooperation in other projects) offer valuable contribution to the project's continuous development.

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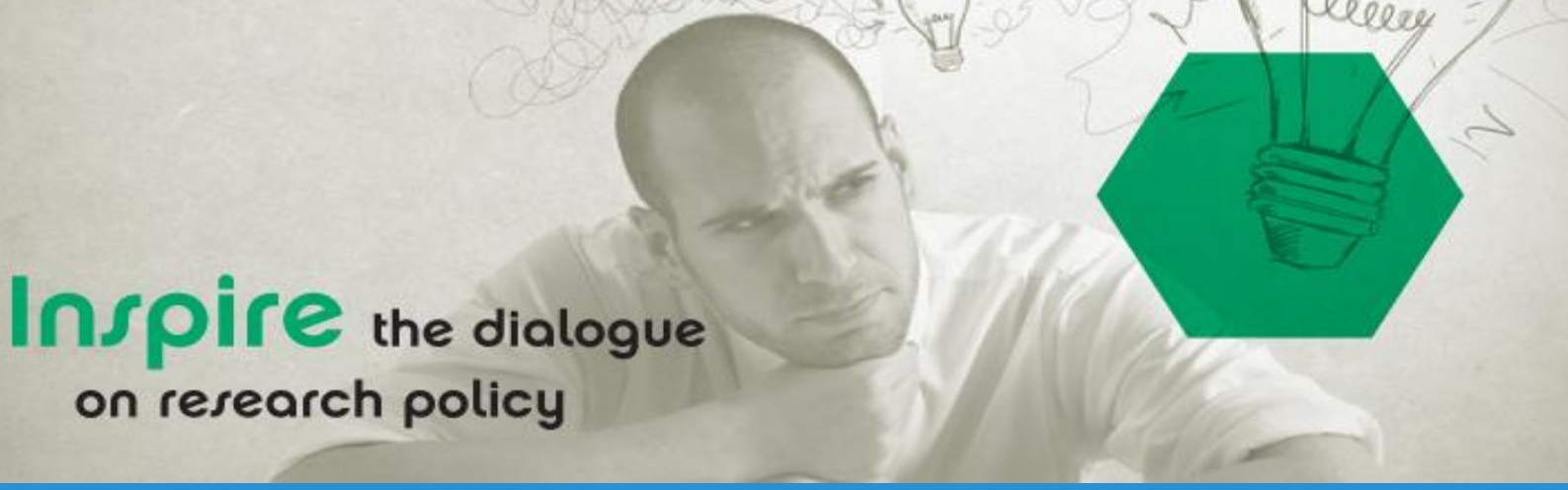


# Responsible nanotechnology R&I – Societal engagement practices

# NanoDiode

## Introduction

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RRI is an approach that anticipates and assesses potential implications and societal expectations, with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations, consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the **NanoDiode** project (Developing Innovative Outreach and Dialogue on responsible nanotechnologies in EU civil society), which was funded under FP7 – NMP. Data for this report were gathered via desk research as well as through an interview with Dr Daan Schuurbiers, Director of De Proeffabriek, a consultancy for responsible innovation centrally involved in the NanoDiode project.

The European FP7 project NanoDiode, launched in July 2013 for a period of three years, aimed to establish an innovative, coordinated programme for outreach and dialogue throughout Europe to support the effective governance of nanotechnologies. NanoDiode combined '**upstream'** public engagement (by way of dialogues that integrate societal needs, ideas and expectations into the policy debate) with '**midstream'** engagement (by organising innovation workshops at the level of the R&D practices that are at the heart of the research and innovation enterprise) and '**downstream'** strategies for communication, outreach, education and training. The project also sought to provide **policy feedback** to Horizon 2020, by assessing the impact of the project's activities.

Out of the several vital engagement activities integrated by NanoDiode along the innovation value chain, the Nano2All team, in this report, chose to focus on a single component of the upstream engagement endeavour of the project: **the Multi-stakeholder dialogues**. Our aim is to provide, in a nutshell, the main points of the

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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practice, in terms of preparation, process and outputs/results in order to inspire and motivate a wider application of such mechanisms. Further to that, we tried to capitalize on the overall achievements of the NanoDiode project, through a findings & recommendation section - at the end of this report - providing valuable insights on the broader integration of societal engagement in the R&I system.

## The Multi-stakeholder dialogues

NanoDiode organised a series of citizens' dialogues in Austria, France, Italy, Germany, the Netherlands and Poland in 2014-2015 complementing the project's objective to develop a coherent picture of how public perceptions can be fed into research and policy processes. Lay citizens were invited to discuss together with researcher, industry representatives, CSOs and public authorities what kind of nanotechnology innovation is desired, how ethical, social and environmental concerns could be addressed and the risks and benefits of the technologies communicated to the public.

The events in the six NanoDiode partner countries varied in terms of size – from smaller dialogue groups of 20 participants to citizens' conferences with up to 80 participants, involving a total of 250 people. They were organized in ministerial buildings or town halls, science museums, showrooms, universities or even theatre buildings. They included presentations, moderated workshops and dialogue stations, poster exhibitions, videos and possibilities for informal networking. Despite this multitude of settings, the dialogues followed a previously agreed concept that allowed non-expert citizens first to inform themselves on the technologies and then discuss these with local stakeholder communities. The core of the concept consisted of moderated dialogue stations: After pitches by researchers and SMEs, the citizens were invited to discuss the applications they were most interested in directly with the people working with them. The citizens were encouraged to bring forward their own views, preferences and recommendations for nanotechnology innovation, which were picked up by the moderators.

*Source: NanoDiode (Multi-stakeholder Dialogue in Germany)*

Despite the variety of approaches used for invitations, the NanoDiode partners organising the dialogues faced difficulties in getting their primary target group – citizens with little or no experience of nanotechnologies – to participate and the numbers of citizen participants remained in all countries relatively moderate. With the exception of the Netherlands[2], the citizens were not remunerated for their participation. As a consequence, technology affiliated citizens formed a large part of the audiences and different population groups ended up being over or underrepresented. However, a balanced representation in terms of age and gender could be achieved in most countries.

## Recommendations for organising citizen&stakeholder dialogues

NanoDiode's citizen & multi-stakeholder dialogues succeeded in creating a space for direct dialogue between citizens, technology developers and representatives of different stakeholder groups. Through the events organised in the six countries, NanoDiode partners identified and discussed a number of characteristics of meaningful and attractive dialogue with citizens and stakeholders which they translated into **ten**

[2] In the Netherlands, citizens were first introduced to nanotechnologies via an online panel and offered gift vouchers for taking part in the dialogue

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**recommendations for organising citizen & stakeholder dialogues**: Rather than advocating a one-size-fits-all method, NanoDiode invites different organizations interested in engaging in a dialogue to develop their own approach for accommodating these key issues:

1. Make sure that the dialogue can have a role in the development of technologies, products, communication or policies; Although citizens' recommendations cannot always be directly implemented, the meaningfulness of a dialogue can be measured with its openness in terms of results and the responsiveness of technology or policy developers.

2. Choose the location and time of the dialogue carefully, accommodating the needs of the dialogue's principal target groups; Whereas town halls or ministerial buildings can as venues stress the significance of an event, choosing locations such as libraries, neighbourhood centres or malls – locations that citizens know and already frequent – can make participation easier, especially for those not accustomed with these kinds of dialogues.

3. Invest resources in inviting different groups of participants via multiple communication channels;

4. If possible, partner with museums, schools, universities or public authorities for increasing the legitimacy and visibility of the dialogue;

5. Communicate the possibilities and boundaries of the dialogue in a transparent way;

6. Provide the participants balanced information on general risks and benefits of the technologies – link the technologies and the dialogue to societal challenges;

7. Link the dialogue to developments or applications that could play a part in people's lives;

8. Make sure the participants get enough time and space to bring forward their own ideas;

9. Pay attention to professional moderation and documentation of results – engage professional moderators if possible;

10. Document the implementation of dialogue results in a transparent way – if the results are not implemented, the need for transparent communication (why?) is even higher.

*Source: NanoDiode (Multi-stakeholder dialogues in the Netherlands*

On the whole, the windows of opportunity for productive stakeholder engagement need to be more accurately defined in terms of the mandate (embedding in formal processes), added value for participants, organisational settings and expected impact.

**Citizens' and multi-stakeholder dialogues are most useful in early stages of technology development or regulatory policies**: at this stage, products and policies can still be attuned to the needs and concerns of citizens and stakeholders.

To encourage uptake, dialogues should be **specific enough to affect the decisions of the actors**. This applies to the topic at hand (what problems are we addressing? What sort of change do we want?), but also with respect to possible courses of action (who is the problem owner? What actions can address the issues identified during the meeting?). At the same time, **stakeholder dialogues should not focus on 'factual' information** only **but on the underlying normative questions as well**: why stakeholders feel they need certain types of information to make an informed decision, why they think that matters, and what solution would be considered satisfactory.

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Thus, the discussion is lifted to a level where the underlying worldviews are discussed. This creates room for **mutual learning** which can engender better understanding of the underlying concerns.

Overall, dialogues will have a more lasting impact if they are set up as **integral elements of formal policy processes**, organised by central stakeholders on a longer timeframe, spanning several meetings.

## Steps towards the integration of societal engagement in R&I

The NanoDiode project identified both **opportunities and challenges** for strengthening stakeholder engagement in research and innovation. Its diverse engagement activities created a space for open dialogue at different stages of the research and innovation process. They strengthened the role of stakeholders as political actors by facilitating direct, application-focused contributions and allowing a deeper understanding of public preferences. They also presented opportunities to adjust the direction of research and innovation in light of societal considerations, with the potential to enhance both the quality of the outcomes and their social acceptability.

Through a comprehensive study of the NanoDiode experience as a whole, we chose to synopsise here some key findings and recommendations considering the broader integration of societal considerations in the R&I system:

To unlock the potential of nanotechnologies to effectively address the global societal challenges we are facing today, we have to **put societal considerations at the forefront of the research and development system**.

In terms of application-driven research funding, we need to rethink the cultural norms that govern R&I practices. To that end, several European projects are currently focusing on societal engagement and responsible research and innovation. Collectively, these endeavours highlight the necessary conditions for productive stakeholder engagement and strengthen the role of stakeholders at different stages of the innovation process. However**, the lack of integration of these insights within technological programmes limits their capacity to enhance responsiveness of research and innovation in the long term.** While Responsible Research and Innovation (RRI) is formally integrated as a cross-cutting issue in Horizon 2020, it is not always clear what exactly this implies for specific programmes and projects. **There is no clear structure or systematic approach at the project level that defines, when, where and how stakeholders are to be engaged.**

This suggests that further experimentation is required along the following main lines:

Considering that public confidence in nanotechnologies is ultimately a function of the responsive capacities of the research and innovation system, the effective governance of nanotechnologies will require that **measures to incorporate different viewpoints are structurally embedded in decision making processes on nanotechnologies**. A continuous platform, bringing together research, industrial, policy and societal actors, would enable mutual learning within the platform of what works and what doesn't, gathering expertise on effective governance mechanisms.

Additionally, the functionality and applicability of stakeholder engagement need to be clearly presented to those wishing to invest in the field. Existing experience should be made more accessible and actionable through the **creation of concrete, ready-to-use tools that people can work with for each of the possible different types of stakeholder activities, suggesting where they have been employed, by whom and with what concrete outcomes**. For example, citizens' panels or deliberations can be useful to assess public views in the early stages of emerging technologies with a disruptive potential, while user committees are more appropriate in highly applied research contexts where industrial users or consumers can express their interests. This endeavour would require **support from those with experience in organising the different activities which could be offered** for example through an expert service on societal stakeholder engagement along the lines of

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the Exploitation Strategy and Innovation Consultants (ESIC) service within the European Commission's NMBP programme.

Experience within the NanoDiode project shows that the effective integration of societal considerations in research and innovation requires **a culture change, where the success of research and innovation - and the career opportunities of researchers - is also determined by the societal benefit of the outcomes.** This change will involve – together with nanospecific education inclusion in (pre-) university level - rethinking academic reward structures. This extends to the assessment criteria for awarding research proposals, to the peer review of research papers, to the criteria for career advancement, and to the criteria by which researchers evaluate each other's work. It will also require compelling examples of how the integration of societal considerations demonstrably led to new opportunities for researchers.

Buy-in from all stakeholders will be essential for the transition towards a research and innovation system where societal considerations become part of the innovation drive rather than a problem to be addressed.

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Source: BMBF

# Responsible nanotechnology R&I – Societal engagement practices

# Citizens meet experts - BMBF (Germany)

## Introduction

**NANO2ALL** is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in our region.

RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

In the present report we aim to present a societal engagement practice which brings together citizens and experts to discuss Research and Innovation (R&I) in Nanotechnology in Germany. The practice is implemented by the German Ministry of Education and Research (BMBF). The report, first, describes the contribution of BMBF in R&I in Nanotechnology and explains how it fosters RRI. Second, it summarises the main aspects of the societal engagement practice and, third, it concludes with lessons learnt and recommendations for similar endeavours. The report has been developed via desk research and an interview with the facilitator of the societal engagement practice of BMBF.

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# BMBF: R&I and RRI

BMBF for Research and Innovation (R&I)

BMBF is the central policy-making body of Germany in education and research. It has a strategic role as regards the future of R&I in the country, as it organizes the system of science, and sets the research and innovation agenda. Besides this, it plays the role of funder, providing support to future technologies, including Nanotechnology. In 2017 BMBF invested more than 17 billion Euros in education and research.[1]

For BMBF, education, research and innovation are key areas for the future of Germany. Research is seen as salient to tackle global problems such as the question of sustainability and problems of public health, while innovation can promote the competitiveness of the economy. Promising technologies such as Nanotechnology are supported by BMBF to lay the foundations for the transition to the Fourth Industrial Revolution.

In particular and as regards Nanotechnology, in the Nanotechnology Action Plan2 the Ministry sets out the strategy for the future of this technology in Germany, the instruments to foster value-added R&D for the development of products made in Germany, and the ways to address the risks of Nanotechnology for the environment and human health.

Responsible Research and Innovation (RRI) at BMBF

Judging from the above-mentioned focus of the Ministry on addressing the risks of Nanotechnology, we conclude that RRI (even when it is not named as such) is particularly pronounced in the R&I philosophy of BMBF. This is demonstrated as well in the following points:

- First, for BMBF innovation encompasses as well social innovation, which involves societal actors as central players in R&I processes.
- Second, the Pact for Research and Innovation[3] aims among other things to strengthen the exchanges with businesses and society and to create R&I structures which are equitable and family-friendly.
- Third, in the same Pact, the goal of attracting younger researchers and of promoting female top staff in leadership positions is also centre-piece.
- Last and importantly and as regards a number of technologies, including Nanotechnology, the Ministry organises a number of events called “citizens meet experts”. These events enable societal engagement in Nanotechnology, thus informing thoroughly citizens who can then express their needs, values and concerns regarding Nanotechnology. The rationale for these events is accountability (citizens must be aware why funds are spent in Nanotechnology R&I) and responsiveness of the Ministry towards emerging concerns of the public as expressed in the Media. The contents of this stakeholder engagement practice are presented below.

# “Citizens meet experts”: BMBF and societal engagement in Nanotechnology

Societal engagement in the case of the BMBF practice focuses on the topic of safety of Nanotechnology, since this is the one mostly emphasized by the citizens and the Media. Additionally, risks and opportunities arising from Nanotechnology are also discussed, as well as the acceptance of this technology by the public. The purpose

[1] BMBF, *Zukunft? Beste Aussichten! Lebenswertes Land – Mit Bildung und Forschung*, https://www.bmbf.de/pub/Zukunft_Beste_Aussichten.pdf (accessed: June 19, 2018) p.8.
[2] BMBF, *Nanotechnology Action Plan: An inter-departmental strategy of the Federal Government*, https://www.bmbf.de/pub/Action_Plan_Nanotechnology.pdf (accessed: May 20, 2018).
[3] For more details, see: https://www.bmbf.de/de/pakt-fuer-forschung-und-innovation-546.html (accessed: June 19, 2018).

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is to inform the public about research which tackles safety aspects of Nanotechnology, in order to address the concerns of the citizens and ensure that scientific facts and not Media hype inform the crucial debates about this technology.

In the events, the main part is the interaction of citizens with scientists. Citizens ask questions to the experts to get a better understanding of the topic. The events are open to everyone interested to join and there are no prior requirements for participation. In order to enable a debate of high standards, information materials are distributed to the participants so that they become aware of the basics of Nanotechnology. Additional information is published on the internet and the participants are informed about this in advance.

The societal engagement practice started between 2008 and 2010 and still continues with events taking place twice a year in different regions in Germany in order to cover the country completely. Recently the practice has been altered as Nanotechnology is now being integrated into the broader theme of Materials Science. This is related as well to the fact that the pressure from the Media on Nanotechnology safety has declined.

The sessions have been evaluated as very successful, judging from the number of people who have participated and from the general feedback of the participants. Citizens have been able to ask questions after the end of each event and all questions have been answered. The results from the events have primarily comprised questions and answers on practical matters. However, when the considerations of the public are relevant for the R&I agenda of the Ministry, these are taken into account in future decisions about research funding, particularly in the thematic area of safety. Thus, citizens via their participation in these dialogues have influenced to a certain extent the R&I agenda of Nanotechnology.

Judging from the early start of this societal engagement practice, BMBF is one of the pioneers in the field of societal engagement in Nanotechnology. The same can be said about other Ministries in the Federal Republic of Germany (such as the Ministry of the Environment), which is organising dialogues engaging a number of stakeholders (such as NGOs and other civil society organisations), as well as industrial actors in Germany who have been engaging with stakeholders for a significant period of time. Therefore this aspect of RRI is well-developed in Germany.

## Recommendations

For parties who would like to organise similar societal engagement events, we received the following recommendations from the facilitator of the events:

- First, the organisers should make the event open to the public. It should be made clear to the citizens that anyone who wants to join is welcome regardless of their background or prior knowledge.
- Second, to involve as many stakeholders as possible. The events that BMBF organised were targeting citizens and experts. However, it is advised to engage a multitude of stakeholders, such as NGOs and the civil society in general and the industry.
- Third, to communicate in an open manner and based on scientific evidence. A primary goal of the BMBF events were to respond to media headlines which were exaggerating about the issue without providing scientific facts. Future events should be based on science too.
- Fourth, to select scientists who are good communicators and can translate scientific knowledge into everyday language. Not all scientists can do so, but at the same time citizens cannot always read and understand scientific papers. Therefore there is a need to bridge this gap and by selecting the right people to communicate the success of an event is assured.

As regards the need to foster RRI in Nanotechnology, the main aspect raised by the representative of BMBF is to make more use of social media. In this way a much larger number of people can be engaged in interactive activities which increase their knowledge and their capacity to be involved in technological debates.

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Source: https://cns.asu.edu/fct

# Responsible nanotechnology R&I – Societal engagement practices

# Futurescape City Tours

## Introduction

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RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

**This brief report provides insights into the Futurescape City Tours, a societal engagement practice developed by the Center for Nanotechnology in Society (CNS) at Arizona State University (ASU). It begins by describing the role of the centre and its early experiences with public engagement on nanotechnology before delving into the methodology specific to the Futurescape City Tours. The final section offers some reflections on the impact and limitations of this practice.**

Data for this report were gathered via desk research and interviews with David H. Guston, Foundation Professor and Director of the School for the Future of Innovation in Society, and Cynthia Selin, Associate Professor, School of Sustainability.

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# Societal engagement at Arizona State University and the Center for Nanotechnology in Society

The Center for Nanotechnology in Society
ARIZONA STATE UNIVERSITY

The Center for Nanotechnology in Society at Arizona State University (CNS-ASU)[1] was one of several Nano-scale Science and Engineering Centers funded by the United States' National Science Foundation (NSF) and the largest centre of its kind to work specifically on the societal aspects of nanotechnology, integrating research with education and outreach components. While it is no longer extant, a cluster of centres and institutes at ASU continues to address science and society issues and Responsible Innovation.

CNS-ASU's goals were two-fold: to increase **reflexivity** within nanotechnology research ('a capacity for social learning among individuals, groups, institutions and publics […] that expands the domain and informs the available choices in decision making about nanotechnologies.'[2]) and to increase society's capacity to engage in **anticipatory governance** of nanotechnology and other emerging technologies' (managing emerging technologies while such management is still possible,[3] in particular by building capacities for foresight, engagement and integration, as preparation for challenges that not yet known).[4]

In practice, the centre's work took shape in the **research programme 'Real-Time Technology Assessment'** (with research strands Research and Innovation Systems Assessment', 'Public Opinion and Values', 'Anticipation and Deliberation' and 'Reflexivity and Integration') and **two Thematic Research Clusters on anticipatory governance** ('Equity, Equality and Responsibility', and 'Urban Design, Materials and the Built Environment'). While the term RRI is not explicitly used in the centre's activities, CNS-ASU's research programmes concerned key process dimensions of RRI as understood in the academic and policy frameworks in a European context,[5] informed through systematic analyses of research calls in the European framework[6] and global exchanges in the Virtual Institute for Responsible Innovation.[7]

Early on, CNS-ASU proposed and implemented first-ever nationwide participatory consensus conference in the United States: the **National Citizens' Technology Forum (NCTF) on nanotechnologies and human enhancement**[8] took place in 2008 at six sites across the US as a way to obtain informed citizen input on nanotechnology via face-to-face deliberation and online discussion sessions. Results allowed the team to draw the conclusion that deliberation could happen online, albeit with different qualities than face-to-face deliberation. In addition, several indices were measured during the NCTF, and results showed that participants' feelings of 'being competent to discuss issues like those raised in the deliberations' (known as internal efficacy) increased while participants' feelings that 'their opinions or actions can actually affect political outcomes' (known as external efficacy) decreased.[9] One hypothesis postulated to explain this finding was that **the nature of a discussion-based activity – the lack of active doing and making – might have led to a lack of growth in external efficacy**.

[1] "Center for Nanotechnology in Society at Arizona State University (CNS-ASU)," CNS-ASU, accessed March 5, 2019, http://cns.asu.edu/.
[2] Guston, "Anticipatory," 433.
[3] David H. Guston, "The Anticipatory governance of Emerging Technologies," *Journal of the Korean Vacuum Society* 19, no. 6 (November 2010): 433. https://cspo.org/legacy/library/101214F2RN_lib_GustonD2010Antic.pdf.
[4] "About," CNS-ASU, accessed March 5, 2019, https://cns.asu.edu/about.
[5] "About RRI," RRI Tools project, accessed March 5, 2019, https://www.rri-tools.eu/about-rri.
[6] "RTTA 4/3: Integration Policy Studies," CNS-ASU, accessed March 5, 2019, http://cns.asu.edu/research/rtta-4-integration/integration-policy-studies.
[7] "Virtual Institute for Responsible Innovation," CNS-ASU, accessed March 5, 2019, https://cns.asu.edu/viri.
[8] For a detailed overview, consult: Patrick Hamlett, Michael D. Cobb and David H. Guston, "National Citizens' Technology Forum: Nanotechnologies and Human Enhancement," CNS-ASU Report #R08-0003 (2008), https://cns.asu.edu/sites/default/files/library_files/lib_hamlettcobb_0.pdf.
[9] Hamlett, "National," 10.

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As follow-up, the CNS-ASU team reflected on what would be their next stage in the public engagement process and shifted to forms of engagement that included more **active participation and material deliberation** (referring to as 'processes of deliberation and citizen engagement which incorporate an awareness, openness or sensitivity to non-traditional modes of deliberative interaction'[10] such as sound making, discourse making, material objects, bodies, sites and places and emotions and affective experiences). **Futurescape City Tours** can be considered as one methodological innovation that developed from the NCTF experience.

## Futurescape City Tours (FCTs)

Futurescape City Tours (FCTs) are a **novel public engagement activity to anticipate societal dimensions of emerging nanotechnologies and explore alternative futures** developed under the 'Anticipation and Deliberation' strand of CNS-ASU's 'Real-Time Technology Assessment' research programme. It is centered on a walking tour in an urban environment where participants go behind-the-scenes, take photographs, have informal conversations with city planners, policymakers, researchers, and civic leaders and deliberate on the future of their cities or communities, revealing the role of technology in our everyday life.[11] Nanotechnology is particularly suited to such explorations as it is 'expected to be a persistent, pervasive and powerful force in reshaping the urban environment'[12] as technologies, cities and societies develop together.[13]

### Aims

This activity has as **its dominant aim building capacity (skills, tools and knowledge) for participation in public life** in relation to technological subjects such as emerging technologies. During the activities, there is a deliberate attempt to consider broader social questions such as the desirability and implications of sustainability of nanotechnology and not only the risks and benefits of particular technological applications.[14]

Moreover, in its choice of methods, modes of interaction, and facilitation, an FCT **aims to be truly accessible and inclusive, to cater to those who are less vocal and articulate among the general public** (and who get left out from more traditional approaches to public engagement such as focus group hearings, citizen juries or consensus conferences). In the case of the FCTs, the use of photography opens up new possibilities for reflection and communicating across language and knowledge barriers.

### Methodology

The engagement activity consists of **some advance preparation, three sessions, and follow-up**. The recommended group size is of around **15 participants**, although it is possible to carry out the activity with more. Applicants self-select to participate but organisers try to ensure **demographic representation of the city or community** in terms of age, education, income, gender and ethnicity. Other relevant factors are knowledge of nanotechnology, previous experience of community engagement and professional background.

[10] Sarah R. Davies at al, "Citizen engagement and urban change: Three case studies of material deliberation," *Cities* 29, no. 6 (December 2011): 353, https://doi.org/10.1016/j.cities.2011.11.012.
[11] The account of the Futurescape City Tours is based largely on: Cynthia Selin and Jennifer Pillen Banks, 'Futurescape City Tours. A Novel Method for Civic Engagement,' CNS-ASU (2014). http://www.futurescapecitytours.org/brochure-1.
[12] Cynthia Selin and Gretchen Gano, "Seeing Differently: Enticing Reflexivity through Mediate Participation in Place in the Futurescape City Tours," in *Engaging Participatory Visual and Digital Methods*, ed. Gubrium, A. and Harper K. (Left Coast Press, 2015), 88.
2015).https://www.cynthiaselin.com/uploads/4/6/5/7/4657243/fct_selin_gano_digital_methods_july_1.pdf
[13] Davies, "Citizen," 352.
[14] Cynthia Selin et al, "Experiments in engagement: Designing public engagement with science and technology for capacity building," *Public Understanding of Science* 26, no.5 (August 2017): 641, https://doi.org/10.1177/0963662515620970.

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**Preparing for the practice**: Participants are asked to come prepared to discuss the following question: "What are three examples of technological change that have had big impacts in your lifetime?" as a way to orient the discussion on the nature and role of technologies in society. Participants are also given access to background information suitable for different educational and knowledge levels, so that everyone can explore the topic as lightly or as deeply as they wish.

Source: https://ifis.asu.edu/content/futurescape-city-tours

**The first session acts as an orientation**. Discussions reveal participant concerns and interests about the topic and the future of their city or community. This initial session is meant to build trust and comfort. Based on its results, the organisers design a walking tour of city or community responding to three to five interests identified.

**The second session is a guided walking tour**. Participants are asked to write down reflections in a workbook and take photos of where they see the past persisting, the present embodied, and the future emerging. Along the way, they meet experts and stakeholders in different formats: from more traditional expert panels and Q&A sessions to informal conversations. The exchanges are designed with the aim to down the expert/layperson divide and allow participants to bring their own expertise to the discussion on an equal footing. At the end of the tour, participants are given instructions on how to work with the images they have taken: photographs that are most important to them are uploaded and captioned via a shared platform such as Flickr.

**The third session consists of guided deliberation**: Participants use the photos taken during the tour to discuss aspects of the past that should persist, identify positive and negative characteristics of the present and create a time-collage reflecting imagined futures for their cities. The photographs and timelines can also serve as the basis for exhibitions that are open to the public or around which further engagement activities can be built (e.g. presentations, interactive experiences or maker spaces during which other citizens can add their own impressions).

## In practice

The **first pilot Futurescape City Tour took place in Phoenix, Arizona over the course of three months in 2012** and involved 16 participants with the topic of how emerging technologies and nanotechnologies in particular might transform the urban landscape. Participants revealed their initial interests to be solar and alternative energy, public spaces, transportation and water, and this led to the design of a tour that featured a visit to a solar panel installation and meetings with the principal and a student from a local biosciences high school, a photovoltaic researcher from ASU and a representative from the company that makes solar panels.

The pilot helped researchers learn how to support participants in taking photos and generating captions: a small training was added to provide structure and prompts around how to articulate ideas. Researchers also understood that **experts and knowledgeable stakeholders must also be guided to understand that their role was not to educate but to be supportive and responsive to the group's learnings**. This formed part of a broader attempt to bring control to the participants and shift the traditional power balance.

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As a result, small alterations were made to the practice and these changes were incorporated in a **subsequent coordinated implementation of Futurescape City Tours**: in 2013, science centres and museums in six different cities (Edmonton in Canada and Phoenix, Portland, St. Paul, Springfield (Massachusetts), and Washington in the United States) carried out the practice. A **methodological guide, website and video for city planners, researchers and the public were developed to allow the implementation of Futurescape City Tours** in other locations and on other emerging technologies or topics of concern.

Source: https://ifis.asu.edu/content/futurescape-city-tours

## Reflections

While a post-event survey taken after the FCTs showed promising signs of capacity building on several aspects necessary for civic participation,[15] evidence on longer-term impact remains only anecdotal: a maker space from one of the implementation sites continued to engage actively with their community after this experience, and FCTs participants continued to attend public talks and events, feeling that they have discovered a new community. In future iterations of the practice, it is recommended that **more attention be given to the longer-term effects of such interventions**, with systematic follow-up three, nine and eighteen months later.

Despite attention to power relationships in the methodological and facilitation choices, organisers noted that the traditional expert/lay person divide persisted to some degree, 'due to personality differences among lay and expert participants, experts' comfort level at communicating specialist information to general audiences, and the expectations of participants themselves.'[16] More **informal moments of shared experience and conversational exchanges where participants can leave behind their traditional roles should be encouraged**.

The FCTs carried out were not intended to inform policy and decision-making. Including experts and stakeholders in FCT activities might nevertheless create expectations of 'further steps taken after the event to connect insights to policy change.'[17] These **expectations of impact on policy making should be managed so as not to create frustrations**. Organisers can support participant interests while also taking several actions themselves: **sharing findings with the stakeholders involved on the tour** other audiences who can benefit, and **building upon the results to start dialogue using other methods**. Moreover, the impact of participating in an FCT should not be underestimated: it is possible that encountering citizens on a thoughtful journey will result in more take-up and integration of societal perspectives among different stakeholders than being the target of traditional dissemination actions.

CNS-ASU showed proof of concept by demonstrating and researching what would be needed to carry out activities such as FCTs but was not in a position to fully operationalise or implement them.[18] Organisers remark that '**capacity building – the development of the skills and habits necessary to successfully participate in**

[15] More precisely, intrapersonal, political, and civil capacities. Consult: Selin et al, "Experiments," 644-645.
[16] Selin and Gato, "Seeing," 93.
[17] Selin and Gato, "Seeing," 95.
[18] Guston, "Anticipatory," 439.

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**public life - requires practice and opportunities to engage'**[19] which implies the need for additional funding for similar initiatives.

[19] Selin et al, "Experiments," 645.

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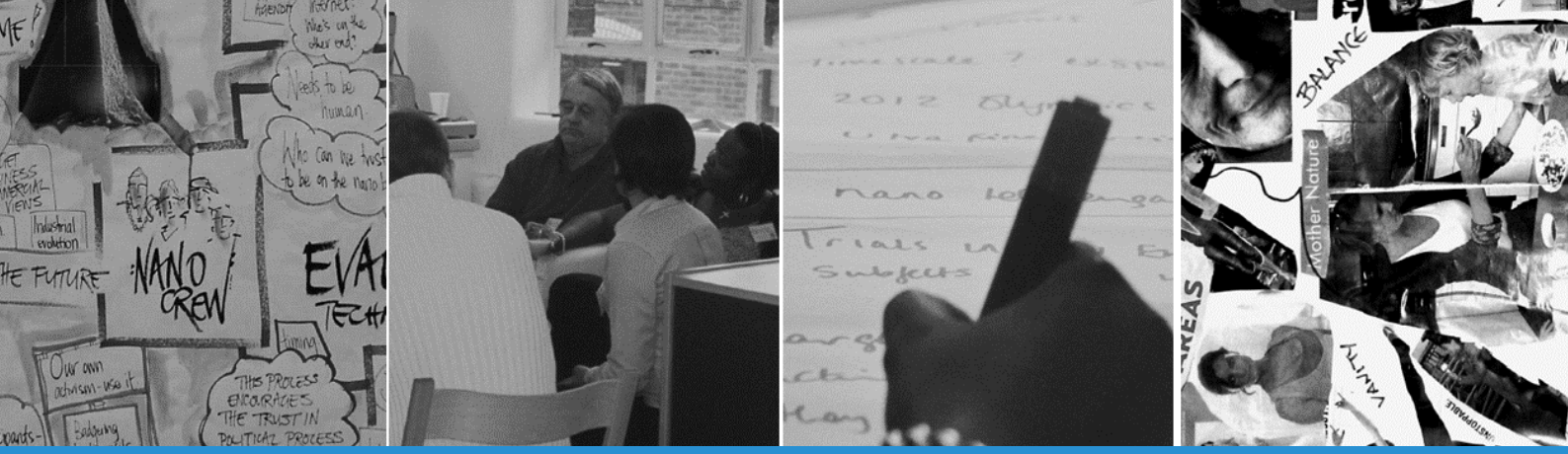


Image source : Demos (2007)

# Responsible nanotechnology R&I – Societal engagement practices

# Nanodialogues (United Kingdom)

## Introduction

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RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the **Nanodialogue on land remediation using nano-particles, one of four dialogues held as an experiment in upstream public engagement with nanotechnology** funded by the British government's Office of Science and Innovation and conducted from January 2006 through January 2007 by the British think tank Demos. Data for this report were gathered via desk research.

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# The Nanodialogues project

**Demos is an independent, cross-party think tank based in the United Kingdom** that specialises in the development of evidence-based solutions on issues of social policy. It was founded in 1993, and has since worked on a variety of questions including – but not limited to – poverty, education, community issues, finance and the impact of new technologies. The Nanodialogue project pertains to the latter field.

The early development of nanotechnology, back in the early 2000s, took place in what Demos researchers described as "an institutional void," with "policy-in-the-making designed to accommodate science-in-the-making." At the same time, it coincided with an increased urgency in increasing public involvement in decision-making, particularly regarding science – a field where such initiatives had found it difficult to gain traction before.[1] The emergence of nanotechnology was seen as an opportunity to try engagement 'upstream', before public views on the topic become polarised.

In an attempt to address these issues in the UK, and responding to the 2004 report "*Nanoscience and nanotechnologies: opportunities and uncertainties*"[2] by the Royal Society and the Royal Academy of Engineering calling for more research into public attitudes and government-initiated dialogue, the British government's Office of Science and Innovation commissioned in 2005 the Nanodialogues project with four major goals:

- "**experiment with new methods of 'upstream' public dialogue on nanotechnologies**;
- ensure that these dialogue experiments were framed in a way to **inform institutional decision-making and priority-setting**;
- **generate intellectual and practical resources** for public, policy and scientific debate about the social implications of nanotechnologies;
- **identify wider lessons and insights** to inform the policy and practice of public engagement in science and technology."[3]

To meet those goals, Demos led **a series of four experimental dialogues** on different themes relating to nanotechnology, its usefulness and its regulation. The first dialogue held in partnership with the UK Governement's Environmental Agency is by far the most publicised and referenced experiment and forms the subject of this report. A brief description of the other three dialogues is available in the text box below.

May through June 2006, Swindon (England): in partnership with the Biotechnology and Biological Sciences Research Council (BBSRC) and the Engineering and Physical Sciences Research Council (EPSRC), DEMOS aimed to broadly **explore the potential for public engagement in shaping public research agendas and policy**, particularly relating to the convergence of nano- and biotechnologies.

July 2006, outskirts of Harare (Zimbabwe): in partnership with the campaign group Practical Action, DEMOS facilitated a discussion **focused on the usefulness of nanotechnology to communities in developing countries**, particularly to obtain clean water.

December 2006 through January 2007, Port Sunlight, Newcastle and London (England): in partnership with the company Unilever, the dialogue **tackled the question of upstream public engagement in *corporate* research & development**.[4]

*Textbox 1. An overview of three of four dialogues conducted under the Nanodialogues project*

[1] *Nanodialogues – Experiments in public engagement with science*, Jack Stilgoe, Demos report (2007)
[2] *Nanoscience and nanotechnologies: opportunities and uncertainties*, The Royal Society (2004)
[3] *Science Report – A people's inquiry on nanotechnology and the environment*, Irving *et al.*, Environment Agency report (06/2006)
[4] *Governing at the Nanoscale – People, policies and emerging technologies*, Kearnes *et al.*, Demos report (2006)

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## A people's inquiry on nanotechnology and the environment – design and operation

The first UK Nanodialogue was held from January through February 2006 in London in partnership with the Environment Agency. It **discussed the use of nanoparticles for environmental remediation (clean-up) of chemical contamination in the ground**, asking whether the method was safe enough to authorise.

The dialogue consisted of **three meetings**. **13 citizens from East London** formed the 'people's panel'; they had previously expressed their interest in such exercises and were paid for their time, but didn't know the topic or nature of the activity before the first meeting itself. Among them were two teachers, a recruitment consultant, two nurses, a web developer and a full-time mother. A group of **twelve professionals** including representatives of the Environment Agency, researchers from multiple universities and Greenpeace and Corporate Watch staff brought **VIPs – very important perspectives on the issue at hand** throughout the three days. Their role was foreseen as not just explaining the facts but reflecting on the limits of available knowledge and engaging with citizens' questions.

The three meetings, each lasting five hours, were facilitated by Demos staff. During the meetings, the people's panel were invited to **ask the experts any questions that came to mind and to freely discuss and explore the issues at hand**. Moreover, they were asked to **contribute their own ideas and perspectives**, which the experts might benefit from. At the end of the process, **the panel were asked to formulate recommendations to be addressed to policy-makers**. The organisers preferred to avoid the language of a citizens' jury (e.g. 'charges,' 'witnesses,' and 'verdicts'), considering this antagonistic.

The discussion touched upon themes such as **uncertainty** (about effects and ways forward, which may not be easily resolved through more research), **openness** (a mindset of open and pro-active sharing of information as problems are collective), **placing discussions of science, technology and risk in context** (broader issues at play, various pressures such as time, the viability of alternative technologies), regulation (an open, flexible approach); **consultation, communication and engagement** (more opportunities, at different levels) that took shape as 12 recommendations supported by all participants. The organisers describe the final mood of participants as one of informed scepticism, including about whether their recommendations would make a difference.

Follow-up was considered important by all those involved. The recommendations were transmitted to the government's **Department for Environment, Food & Rural Affairs** (Defra). An additional meeting was also convened in May 2006 between four panel members and three members of Defra's nanotechnology policy team to **reflect on their experiment and hear about the government's approach to nanotechnology and the environment**, a discussion that by all accounts proved empowering. Defra responded to the people's panel in writing in September 2006. Furthermore, Demos took internal steps to inform their staff of the issues raised and engage with government (both local and national) in hopes of ensuring that the panel's recommendations would be taken forward in other ways.

In the months following the first workshop, **the British government passed legislation on nano-remediation that mostly echoed the panel's recommendations**. It remains difficult, however, to precisely evaluate the

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Nanodialogues project's impact on this legislation, as the recommendations it produced were largely in line with those of the major scientific institutions of the Royal Society and the Royal Academy of Engineering.[5]

## Evaluation & recommendations

The University of Liverpool undertook an independent evaluation of the Nanodialogues project's first workshop. The verdict is largely positive: evaluators noted that the initiative was widely perceived by participants as worthwhile and a step in the right direction. Evaluators were also impressed by the interpersonal quality of the engagement, the amount of knowledge it generated and the openness and transparency of the Environment Agency throughout. A few highlights from their observations are presented below.

Participants reported the engagement to be enjoyable. The retention rate was high, with participants continuing to look up information or discuss the matter with colleagues, family and friends between the sessions. On the part of the organisers, there was **clear communication about the objectives of the engagement practice and a willingness to consider and discuss with participants how this experiment fits in the policy-making process**.

Expert advice was delivered in a conversational style, with participants being encouraged to challenge expertise, explore issues of uncertainty and identify topics of importance. This allowed their own social knowledge to be incorporated in the discussion. The fact that organisers were **open to side discussions on participant interests'** such as health and safety and trust in the government also contributed to an open and engaged process.

However, some panel members reported scepticism as to the sincerity and usefulness of the exercise. It was felt that they would have been better served if the panel had had **a voice in the selection of experts and the general shaping of the experiment**. Indeed, the experts had been selected in advance and came mostly from a research perspective, leading to a rather science-heavy discussion. The organisers could not respond to participant requests to meet with Defra representatives or the Member of Parliament for East Swindon.

The Nanodialogues were also intended to contribute to the understanding of the practice of (especially upstream) public engagement. Evaluators remarked that the topic under discussion, a regulatory case, could not be characterised as upstream as the use of nano-particles in land remediation was already a well-developed technology and trials had already taken place in the United States. Participants raised questions and suspicions about plans to use this technology in their area. Ultimately, **discussions gravitated towards the wider place of nanotechnology in society at large** (and the panel's recommendations were also framed in this way) rather than just in relation to managing risks associated with the implementation of this particular technology.[6] Nevertheless, the Environmental Agency as the activity's sponsor and participants alike found the discussion useful and productive. The discussions also showed that governance matters are interesting to the public at large.

[5] *Improving Risk Governance of Emerging Technologies through Public Engagement: The Neglected Case of Nano-Remediation?*, Grieger *et al.*, in *International Journal of Emerging Technologies and Society* 10 (2012)

[6] This finding also emerged in the NANO2ALL dialogue processes. See *NANO2ALL D3.3 Responsible Innovation Agendas at national level (2018)*

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Source: Nanopodium

# Responsible nanotechnology R&I – Societal engagement practices

# Dutch Societal Dialogue on Nanotechnology

## Introduction

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RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations, consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

**This short report provides brief insights into the Dutch Societal Dialogue on Nanotechnology that took place from March 2009 until January 2011.** Data for this report were gathered via desk research (reviewing the proceedings from the PACITA 2013 Conference, the final report of the Committee Societal Dialogue and the publication of Lotte Krabbenborg: Involving civil society actors in nanotechnology: creating productive spaces for interaction), as well as the written consultation of Dr. Pieter van Broekhuizen, and Dr. Adrienne Sips.

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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## Societal Dialogue context

The "**Societal dialogue on nanotechnology**" in the Netherlands was mandated by the Dutch government from March 2009 until January 2011, as part of a broader set of societal experiments aimed to support the **responsible governance of nanotechnology in its early stage of development**[2]. The societal dialogue was included in the Dutch Action Plan for Nanotechnology (2008), to **address uncertain and ambiguous risks of nanotechnology** and to reflect on its **broader societal and ethical issues**. The process was organised by an independent committee, the Committee Societal Dialogue Nanotechnology (CieMDN).

CieMDN's main assigned task was to implement "a broad discussion in which viewpoints and opinions could be expressed by all kinds of stakeholders and publics. **The societal dialogue was a bottom-up process and was implemented in the form of small projects** in which CieMDN invested EUR 4 million. The small projects were carried out by civil society organisations, as well as mainly professional organisations working in the interface of technology and society and education[3] who proposed their own interaction activities. The priority themes / nano application areas to be focused during the Societal Dialogue in the various projects were defined by CieMDN in close collaboration with experts and stakeholders from science, industry and civil society organizations.

CieMDN funded altogether 35 projects[4], distributed between four categories (TV programme for a general audience, Publications for a general audience, Activities targeting secondary school children, and Science cafes and discussions all over the country).

## Design & operation

The dialogue's activities enabled several activities where stakeholders and citizens could learn about technology and share their doubts, concerns and views related to societal and ethical aspects directly connected to nanotechnology. The entire dialogue process consisted of the **implementation of two stages: (i) information & awareness raising and (ii) dialogue** within the aforementioned timeframe**.** Therefore, CieMDN subsidised three types of activities / projects: informing the general public or specific groups including youth, awareness raising and bottom-up dialogue activities.

**The dialogue process was designed without any agenda pro/contra nanotechnology**. The main intention was to stimulate and facilitate a societal dialogue and enable a varied range of questions, issues and perspectives. This dialogue approach was chosen intentionally, since previously it was observed that Dutch citizens had a low level of awareness of nanotechnology and nano-enabled products, and nearly half of the population indicated that they did not know anything about this technology.

As referred above, the **priority themes / nano application areas** that served as a basis for discussing risk/benefits of nanotechnology and related ethical and societal issues were **defined by CieMDN** members in close collaboration with experts and stakeholders from science, industry and civil society organizations. They focused

[2] Wiebe Bijker: Technology Assessment: The State of Play, in Proceedings of the PACITA 2013 conference in Prague, pp 23-36

[3] Lotte Krabbenborg: Involving civil society actors in nanotechnology: creating productive spaces for interaction, Ipskamp Drukkers BV, Enschede, Netherlands, 2013

[4] Further details and the list of granted projects can be consulted in Annex I.

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on themes that were not sufficiently addressed, at the time, in the public debate in the Netherlands: health and food, nature and sustainable society, security and privacy, international aspects and sustainable economic growth. While nanotechnology risks/benefits related issues can cover mainly toxicology, economic benefits, labelling and precaution, societal and ethical questions refer to broader aspects that new technologies might trigger, like shifts between natural-artificial, public-private, altered societal values, norms, relations, as well as the way technology is governed[5].

The Dialogue started with a Working Conference and a Zero Measurement of public awareness and opinions on nanotechnology. The website Kennislink – a popular science website - opened a theme page on nanotechnology. CieMDN published a Public Agenda and organised a starting event. The participants (citizens, experts and stakeholders) of the dialogue were invited by an open call in daily newspapers and by direct invitation.

Nanopodium[6] was set up to select the 35 projects and coordinate the dialogue. The project selection was done in two stages; the first-stage projects started in December 2009 and the chosen projects were mainly to **inform the public,** the second-stage projects in the spring of 2010 and this round was more **focused on dialogue**.

**1ST STAGE: INFORMATION AND AWARENESS RAISING PHASES**

The **information and awareness** phases focused on the information provision through media and activities, for instance TV programmes and dialogue activities including websites, social media, school courses, science cafés, theatre play, etc. These engaging methods led to opinion forming and discussion aiming to cope with the lack of knowledge about nanotechnologies amongst many participants and raise awareness about nanotechnology and ethical and societal issues, paving the way for the dialogue phase (2nd stage).

Source: http://www.daandirk.com/portfolio/nanotube/

**2nd STAGE: DIALOGUE PHASE**


The dialogue phase consisted of projects that aimed at stimulating face-to-face and online interactions between technology developers and civil society actors, as well as between citizens. These interactions were science cafés, discussions, theatre performances followed by discussions, among others. Interactions usually used information / awareness raising materials created in the previous stage in order to stimulate discussion (vignettes, film, among others). It is to add that some dialogue activities were more framed towards a one-way communication setting, while others triggered actual interaction between participants (two-way communication).

Source: http://nanopinion.archiv.zsi.at/sites/default/files/webversie_verantwoord_verder_260111_def_compleet1.pdf

[5] Lotte Krabbenborg: Involving civil society actors in nanotechnology: creating productive spaces for interaction, Ipskamp Drukkers BV, Enschede, Netherlands, 2013

[6] Nanopodium is an initiative of CieMDN. Nanopodium is a platform for exchanging ideas, opinions and suggestions to discuss the opportunities and threats of nanotechnology for individuals and society.

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To summarise the Dutch societal dialogue process approach, Table 1 provides a short overview of its design choices including the brief analysis of the intended benefits, potential costs (negative aspects) as well as the actual results of these choices. It is of note that the below design choices relate to the entire societal dialogue process. The design choices of the individual small projects were made by the project proposers within the frames set by CieMDN.

*Table 1 Design choices for the Societal Dialogue on Nanotechnology in the Netherlands, 2009-2011*

| Design element | Design choice | Intended benefit | Potential cost | Result |
|---|---|---|---|---|
| **Organiser** | Independent ad hoc committee, supported by sub-contracted secretarial team (provided by Technopolis, Amsterdam) | Avoid suspicion that the dialogue was "rigged" by the government | No political mandate and thus no a priori commitment by the government to the results | Worked well: participants trusted the process; the vice-minister of social affairs publicly received the dialogue's outcome with positive speech |
| **Budget** | EUR 4 million, to be spent mainly through two open calls for proposals for subprojects (with budgets between EUR 15 and 130 thousand) | Substantive budget helps to generate high quality input; Out-sourcing will help engage broad range of experts | Waste of money; Out-sourcing may result in lack of quality control | Worked well: project generally considered valuable; Most subprojects of good quality with only few exceptions |
| **Agenda** | No agenda in terms of pro/contra nanotechnology; a working conference with experts and stakeholders helped CieMDN decide the content themes and dialogue activities (goal was: to stimulate and facilitate a societal dialogue on nanotechnologies, including their social and ethical aspects, resulting in a societal agenda for nanotechnology) | Open agenda allows for broad range of questions, issues and perspectives | Lack of focus | Worked well: most relevant questions were discussed; participants felt welcome and taken seriously to raise issues. One aspect was insufficiently addressed: international and development questions (including the potential effects on reaching the UN's MDGs) |
| **Content themes** | Five priority themes were defined:<br>•Health and food<br>•Nature and sustainable society<br>•Security and privacy<br>•International aspects<br>•Sustainable economic growth<br>Focus on concrete applications and products was recommended | Limited set of themes to provide focus of the dialogues and to increase opportunity for synergies between subprojects | Wrong choice of themes that does not resonate sufficiently with interests and agendas of participants | Worked rather well: good for structuring the dialogue; but rather an uneven interest distribution in practice, resulting in relatively little attention to international economic aspects |
| **Process phasing** | Dialogue process 2009-2011 had two overlapping stages:<br>1st Stage<br>Information & Awareness<br>2nd Stage:<br>Dialogue | Cope with the lack of knowledge about nanotechnologies amongst many participants | Lack of attention to politically directly relevant issues | Worked very well: good for structuring the dialogue process and for selecting subprojects; subprojects did not feel the phasing as a straightjacket but used it relatively loosely |

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| Design element | Design choice | Intended benefit | Potential cost | Result |
|---|---|---|---|---|
| **Participants** | Invited by open call in Dutch daily newspapers and by direct invitation:<br>•Experts<br>•Stakeholders<br>•Citizens | For the discussion of "ambiguous" and "uncertain" risks participation is needed by experts + stakeholders + citizens | Dialogue of the deaf | Worked well; many activities had heterogeneous participation but some were fruitfully focused on sub-sets of participants (e.g. school children, members of the protestant churches, chemical industry, etc.) |
| **Media & means & activities** | Broadest possible spectrum of media, means and dialogue activities (including websites, social media, school courses, TV programmes, science cafés, theatre play, etc.) | To reach a broad range of participants and to allow for very different styles of thinking, engagements and discussions | Lack of focus | Worked well; different media clearly catered different groups of participants |
| ***Source: Wiebe Bijker (Technology Assessment: The State of Play, in Proceedings of the PACITA 2013 conference in Prague, pp 23-36), http://www.pacitaproject.eu/documentation/*** | | | | |

**SOCIETAL DIALOGUE CONCLUSION**

Based on the outcomes of the funded activities/projects and also from the opinion polls made at the beginning and end of the entire dialogue process, CieMDN delivered an official report recommending moving forward responsibly with nanotechnology. After studying this advice, the government responded formally to it in a letter to the parliament dated 23 September 2011, mainly leaving it up to existing initiatives and organisations including the NanoNext consortium to continue dialogue on the issues raised in the report of CieMDN. The government also declared their intention to address sustainable development, risks and regulation and societal issues of converging technologies (nano, bio, info, cogno), in close collaboration with the social partners, experts and other governments and the EU. The current interest in RRI builds upon experiences in the Dutch and other national and international dialogues on responsible governance of nanotechnology. With hindsight, the Dutch dialogue is most relevant to the RRI keys public engagement, science education and governance.

## Dutch Societal Dialogue Findings

Based on an interview conducted by Dr. Ineke Malsch with Professor Peter Nijkamp (President of the Committee Societal Dialogue Nanotechnology) in 2011, it can be concluded that there is a need to familiarise the members of society with the different aspects and ethical issues in order to be more susceptible to nanotechnology, since it was observed that the general public is not aware of this technology, nor of the risks involved and the economic consequences of its implementation. Considering this**, it is necessary to have a balanced, organised discussion, involving all stakeholders, with formal and informal dialogues, where the contents of the dialogue is determined by society**. This way, society will be positively impacted, since the responsibility for the decision making is held by the people and not by the government and stakeholders. This allows for carefully thinking through /considering unbiased public's position, relying on the information provided by independent mediators and not influenced by third parties. **The Committee responsible for the debate's organisation should be independent,** without the intervention of neither government nor stakeholders and without having a hidden agenda.

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According to the final report of CieMDN, in order to reach a high level of public awareness and engagement, the **information provision on nanotechnology should be delivered first and continually updated** throughout the process. Further to that, the information delivery should be tailored considering the targeted group and the intended scope. **The general public engagement can be done through artistic objects and products**, since they promote the reflection about nanotechnology by making it imaginable. The committee also realized that projects that envisage more than the delivery of information were more successful than the projects that only had the purpose of providing information. It is therefore suggested that, **the provision of information should be combined with activities that focus on opinion forming and exchange**.

With respect to the audience size, **dialogues carried out in small scale** - small meetings, such as focus groups or workshops **had better results and impact** compared to the ones taking place in the Internet forums or panels. The "program" is more profitable in small groups, so that people can be directly involved in the subject.

The **five priority themes defined for the project worked well for structuring the dialogue but received an uneven interest distribution** in practice. For instance, the Committee concluded that more dialogue was needed on the potential contributions of nanotechnology for economic development, especially in developing countries, because Dutch citizens are by themselves already interested in issues closer to home like health, food and privacy.

In addition, based on a short consultation with Dr. Pieter van Broekhuizen[7], it can be concluded that **the long-term effect of the Dutch dialogue on responsible nanotechnology governance is especially the agreement amongst social partners** (employers, organisation and the trade unions), endorsed by the government on the establishment of provisional nano reference values, **and also the establishment of a Guidance for safe working with nanomaterials and nanoproducts** (ranking of hazardous nanomaterials and advising SMEs about how to manage the risks). In his opinion a question that should be answered is:" Why should the general public be more aware of this nanotechnology than the common practice with the development of other technologies?" Dr. Pieter van Broekhuizen points in the direction of the anticipated health hazards of nanoparticles, and the forecasted economic benefits of the use of nanomaterials, which are not necessarily all in the area of (nano)technology. A negatively formulated answer could be: to make the general public co-responsible with the introduction of new materials for which so far insufficient health hazard data are available and a reliable risk governance frame is lacking. I.e. facilitate the industry to carry on with these developments which do not comply with current legislation. As such the nano dialogue could also be classified as a large window dressing operation, but paradoxically very interesting for the heterogenic group of scientists involved in this innovative technology and the governmental policy makers (and some other stakeholders).
With regard to the future, he also stressed that on-going nano RRI and governance projects are the repetition of the same questions and issues discussed in the nanotechnologies' debate. He argues that **new projects should try to avoid this repetition and set a real step forward**. In addition, the **responsibility and roles of researchers and "future designers" should be more explicitly the subject of discussion, and possibly as well the subject of a governance framework**. Nano topic (risks and RRI) is too complex to keep the attention of the public, but **the issue is not really nano, but rather new technologies**. Therefore, the point is to bring forward and discuss questions on **how we like to shape our society, using technologies as solutions for global problems, but keeping the human dimensions as key in our societies.**

[7] During the Dutch dialogue, Dr. Pieter van Broekhuizen was working at the research & consultancy organisation IVAM at the University of Amsterdam. He was the coordinator of the European project NanoCap (2006-2009),, and was involved in the organization of the Social Economical Councils' positioning towards safe working with nanomaterials, and the development of the nano reference values (NRVs) (2008-2012). During the NanoDialogue he participated in different projects, by advising them or participating in meetings, interviews etc. At the same time an Advisory Board on Nano was launched by the Ministry of Environment, in which employers' organisations, industries and CSOs regularly met (about ones or twice a year), and discussed (technical and regulatory) nano-developments. Also, the KIR-nano expert panel was launched, to discuss the fundamentals and impact of the NRVs. He took part in both commissions.

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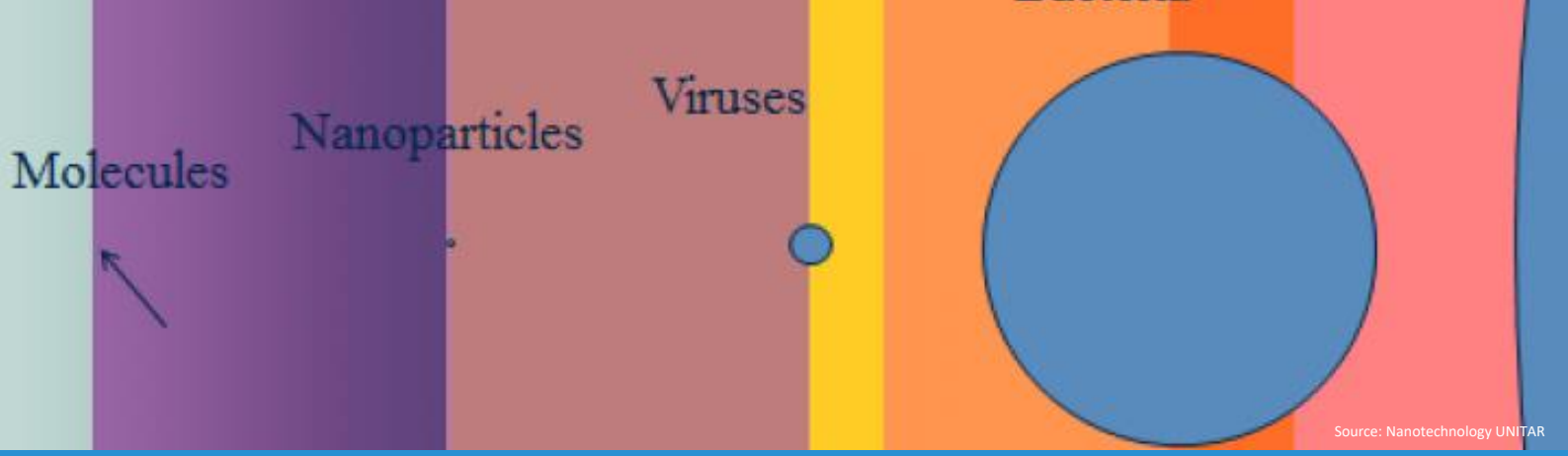

Source: Nanotechnology UNITAR

Responsible nanotechnology R&I – Societal engagement practices

# UNITAR's Nanotechnology workshops in Latin America and the Caribbean

## Introduction

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RRI anticipates and assesses potential implications and societal expectations regarding R&I, to foster the design of inclusive and sustainable R&I. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others), to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

In this report we analyse the role of societal engagement in a series of regional workshops on nanosafety organised in Latin America with the support of the United Nations Institute for Training and Research (UNITAR). It is based on desk research analysing the information and documents posted on the nanotechnology project pages at the UNITAR website, reports on nanotechnology presented during the International Conferences on Chemicals Management (ICCM3 and ICCM4) and interviews with Dr. Georg Karlaganis[1] and Dr Alba Avila[2].

[1] Georg Karlaganis is senior advisor at UNITAR and former head of division at the Swiss Federal Office for the Environment, responsible for the Swiss Action Plan for Nanotechnology in 2008. The interview took place by telephone on 23 January 2019. He contributed slides from his presentation "Emerging Policy Issues – Nanotechnologies and Manufactured Nanomaterials" held 7 September 2018 in Geneva.

[2] Dr Avila is professor at the Universidad de los Andes in Bogota, Colombia, and one of the organisers of the workshop on "NANOTECHNOLOGY and Manufactured nanomateriales in Latina America and the Caribbean-SAFETY ISSUES" in 2015. The interview took place by skype on 15 February 2019.

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## Nanotechnology project UNITAR

UNITAR was established in 1963 as the autonomous training arm of the United Nations system, aiming to "enhance the effectiveness of the UN through diplomatic training, and to increase the impact of national actions through public awareness-raising, education and training of public policy officials."[3]

The nanotechnology project is part of UNITAR's Chemicals and Waste Management (CWM) programme since 2009 and mainly funded by the Swiss government. The CWM offers "support to governments and stakeholders to strengthen their institutional, technical, and legal infrastructure and capacities for sound management of chemicals."[4] UNITAR's nanotechnology project is a part of the wider regulatory framework for nanomaterials at a global level analysed by Georg Karlaganis and Rachel Liechti (2013).[5]

Nanotechnology is an emerging policy issue tabled at the Strategic Approach to International Chemicals Management (SAICM) since the ICCM2 conference in 2009. UNITAR supports the SAICM by building capacity in "developing countries in raising awareness on nanosafety issues and in considering the implications of nano-based and nano-containing products traded across borders."[6]

The UNITAR guidance document "Developing a National Nanotechnology Policy and Programme" (2009) and other materials, form the basis of three rounds of regional workshops on nanosafety organised by UNITAR together with the OECD, and of 2x3 national country projects engaging all relevant stakeholders in developing a policy for governing nanotechnology. In addition, the institute raises awareness, e.g. through an e-learning course introducing nanomaterials safety.

## Regional workshops

UNITAR (mandated by the Swiss government) and OECD organised three series of regional awareness raising workshops in developing countries and transition economies in several UN-regions (Asia-Pacific, Latin America and Caribbean, Africa and Central and Eastern Europe) in 2009-2010, 2011, 2015 and 2018, as well as a sub-regional conference in the Arab world in 2010. Workshops were organised as often as possible, subject to the availability of funding. The regional workshops lasted two days.

In the first 3-year period (2009-2012), the workshops contributed to the preparation of regional positions, resulting in a report to the ICCM3 conference. Participants in the African regional workshop took the initiative to add nanomaterials to the SAICM's Global Plan of Action, which was supported by the South American and Caribbean region. They also recommended that UNITAR and others should continue to support capacity building and national pilot projects. The second round of regional workshops in Africa, Latin America and Asia-Pacific contributed to the establishment of nanosafety networks. The needs and challenges of each region were identified and prioritised, and information exchanged between the participants.

An independent evaluator, Dr Robert Nurick, analysed the impact of SAICM in 2006-2015. On Nanotechnology, 37% of the policy makers and stakeholders reported being very or somewhat successful in incorporating nanotechnology in their activities including stakeholder dialogues, while 24% reported little or no success and 38% did not know. However, national contact points from Africa, Central and Eastern Europe and Latin America and Caribbean reported low success rates, also in public outreach[7].

The focus of this case study is on the societal engagement activities in the subsequent second and third round of regional workshops held in Latin America and the Caribbean, to assess what has been done to address this issue.

[3] Source: http://www.unitar.org/institute

[4] Source: http://www.unitar.org/cwm/

[5] Georg Karlaganis, Rachel Liechti. The Regulatory Framework for Nanomaterials at a Global Level: SAICM and WTO Insights. RECIEL 22 (2) 2013. ISSN 0962-8797

[6] Source: http://www.unitar.org/cwm/portfolio-projects/nanotechnology

[7] http://www.saicm.org/About/SAICMEvaluation/tabid/5513/language/en-US/Default.aspx

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## Latin America and the Caribbean

The second and third "Technical Workshops for the Latin American and Caribbean Region on Nanotechnology and Manufactured Nanomaterials: Safety Issues" were well documented. In 2015, the workshop was held in Bogota, Colombia, on 22-24 June (Avila et al, 2015).[8]


The 30 participants included representatives of 11 countries in the region: Mexico, Ecuador, Costa Rica, Argentina, Chile, Brazil, Uruguay, Peru, Panama, St. Vincent and the Grenadines and Colombia. The programme included presentations about the state of the art and working group discussions to identify gaps in nanotechnology governance that needed to be addressed in the short (by 2015), medium (2015-2020) and long term (2020-2025).

In the interview, Alba Avila explains how the workshop was organised: *"The programme was approved by UNITAR, the Colombian government and collaborating governments, and the program was discussed between UNITAR, the Minister for the Environment and the Universidad de los Andes. Participants included ministries for environment, commerce and tourism, health and education, nanotechnology associations and academia. For Colombia it was part of the process to join the OECD. Participants were active in nanotechnology projects or related to UNITAR. We selected the specific questions that the participants should address in 10-15 minutes presentations. More participants from the Caribbean were invited, but only St. Vincent and the Grenadines was represented. Nanosafety was not yet on the government's table of other countries.* ***One NGO was represented, concerned about nanotechnology in agriculture****. This is an important economic sector in Latin America. While Latin American countries import a lot of nanomaterials, no effort is made to label nanoproducts."*

[8] Alba Ávila, Ana María Ocampo, Oliver Wootton, Felipe Muñoz, Pablo Vieira (2015) Nanotechnology and Manufactured Nanomaterials in Latin America and the Caribbean: Safety Issues (2015: Bogotá, Colombia, https://nanoseguridad.uniandes.edu.co/images/Nanotechnology_ingles_digital_012016AA.pdf and http://www.unitar.org/cwm/nanosafety-regional-workshop-latin-american-and-caribbean-region-colombia

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The UNITAR workshop helped raise awareness of nanosafety in Latin America. As a **follow-up, a slot on nanosafety was included in the programme of subsequent academic nanotechnology conferences,** including the Colombia-US workshop on nanocharacterisation in 2016 and another conference in November 2018. In addition, the next Latin American and Caribbean regional strategy workshop was organised with support from UNITAR and OECD in **Panama on 1-2 February 2018**.[9] This time, 25 participants represented governments, civil society and research organizations, and academia. Several participants had also attended the workshop in Bogota. Some of the same issues were revisited, but also some recent developments including the publication of WHO guidelines for occupational nanosafety and OECD Good Laboratory Practices and Test Guidelines. Several regional collaboration initiatives had started since 2015, including interlaboratory collaboration on test protocols, nanosafety programmes and tools. New offers for sharing information and collaboration were made. **Additional priorities were to include more stakeholders such as civil society, the International Labour Organisation, and Ministries of Health**. Measures to facilitate sharing of information in the region and at global level and traceability of nanomaterials in products were also mentioned.

Some positive impacts of the workshop have been reported. Colombian nanoscientists are collaborating with the national standardisation body ICONTECT[10] and are adapting standards originating from ISO to support the Colombian industry. The Latin American network on Nanotechnology and Society RELANS[11] has used materials collected during the workshop in publications and has extended its regional collaboration. Initiatives are undertaken to include nanosafety in higher education courses and conferences. A list of nanomaterials that are most used in the laboratory and imported or produced in the region has been compiled. Inter-laboratory collaboration was established between Uruguay and Mexico, leading the generation of a technical protocol currently under review by the International Organization for Standardization (ISO). CEDENNA de Chile implemented a Safety program for their nano Laboratories and a risk management framework. And the Universidad de los Andes (Colombia) continue to develop and make available their NanoRisk application[12] (attracting users from the whole region) and guidelines for the handling nanomaterials. Other collaboration offers involving Chile and Brazil were also made.[13] **However, the recommendation to organise periodic stakeholder meetings is not included in an official nanotechnology white paper**. A collaborative proposal has been made to investigate the impact of nanomaterials on air, water and soil. The UNITAR guidelines have not been formally adopted, but academic researchers follow them voluntarily.

## Recommendations and lessons learned targeting societal engagement

According to Georg Karlaganis, SAICM is a good **international platform** to discuss environmental, health and worker protection issues related to nanotechnologies and nanomaterials with policy makers from all world regions and other stakeholders. He hopes this discussion will be continued after 2020.

Alba Avila remarked that the interest of well-known **international authorities** (UNITAR, OECD) in nanosafety helped raise interest of local governments. The report of the regional workshop[14] has a **formal** ISS-number and can be used in education courses. The **UNITAR guidelines** form a solid basis that can be adapted to specific national circumstances.

[9] Nanosafety Workshop for the Latin American and Caribbean region, Panama City, Panama – 1 and 2 February 2018, http://www.unitar.org/cwm/nanosafety-regional-workshop-latin-american-and-caribbean-region-panama
Workshop summary
[10] https://www.iso.org/member/1644.html
[11] http://www.relans.org/inicio.html
[12] https://nanoseguridad.uniandes.edu.co/nano_en/indexeng.html
[13] Details are included in: Nanosafety Workshop for the Latin American and Caribbean region. Panama City, Panama – 1 and 2 February 2018. Workshop summary (17 April 2018)
[14] available online via the website: https://nanoseguridad.uniandes.edu.co/

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Lessons learned include the following: Because there was no **globally binding regulation** governing nanomaterials, national and international authorities invested little resources in societal engagement in this project. If risk governance of nanomaterials would have been mandatory, these authorities were obliged to take action to implement it, but now other priorities prevailed.

In addition, it turned out to be difficult to attract **additional funding** to the funding from the Swiss government. Efforts are underway to apply for funding from the Global Environmental Facility (GEF) for continued discussions at SAICM on environment, health, worker protection and other and safety issues of nanotechnology after 2020. Georg Karlaganis gives an example to illustrate why this is needed: “African countries are interested to continue discussions of nanosafety, e.g. to be able to assess the risk of nanoparticles which are imported from European countries for downstream use in Africa. Without proper worker protection, the local users can put themselves at risk.” Likewise, Alba Avila stresses that funding from local environmental authorities or industrial ministries is needed for data collection and for organising regular stakeholder meetings to exchange information and foster collaboration, to maintain the momentum.

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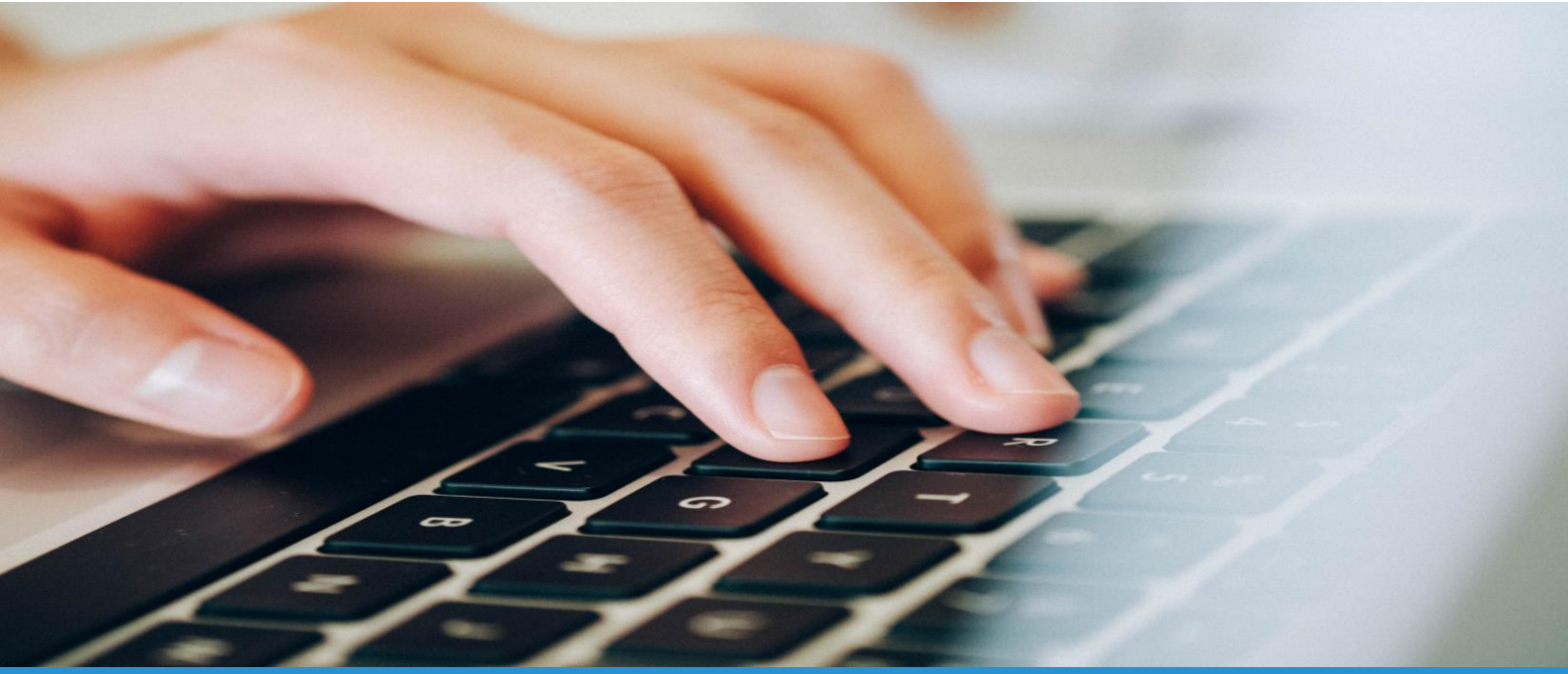

# Responsible nanotechnology R&I – Societal engagement practices

# NANOPLAT

## Introduction

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RRI is an approach that anticipates and assesses potential implications and societal expectations, with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations, consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the **NANOPLAT (Development of a Platform for Deliberative Processes on Nanotechnology in the European Consumer Market)** support action, whose main objectives was to evaluate selected deliberative processes in Europe and develop a deliberate and science-based platform for a stakeholder dialogue for research and political actions. Data for this report was gathered via desk research and an **interview with Pål Strandbakken, Researcher at Høgskolen i Oslo, Consumption Research Norway (SIFO)** and **an interview with François Jégou, Director of Strategic Design Scenarios in Belgium**.

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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## NANOPLAT Consortium

The NANOPLAT Consortium was coordinated by the Consumption Research Norway (*Statens Institutt for Forbruksforskning*, SIFO). SIFO is a non-profit, transdisciplinary research institute at the Centre for Welfare and Labour Research at OsloMet, the Oslo Metropolitan University. SIFOs[2] aim is to understand the role of consumption and consumers in society and to provide the knowledge basis for public consumer policy in Norway. Created in the 1930s with the start of home economics, laboratory work and product testing was until recently a central part of its operations.


The consortium of NANOPLAT was formed by the University of Manchester, IÖW in Berlin, Central European University in Budapest, Sabanci University in Istanbul, Bergen University and Strategic Design Scenarios in Brussels.

## Deliberative process developed in NANOPLAT

NANOPLAT reviewed a selection of deliberative processes related to nanotechnology in Europe to identify the necessary conditions for them to be able to enhance the democratic processes. Different **forms** of deliberative processes exist (driven by a wide variety of organisations) —from a one-evening event to processes running over half a year— with varying number of participants in each exercise. Both direct/tangible **outcomes** (recommendations, reports, etc.) and indirect/intangibles ones (learning experiences of participants) can be found. But the actual **impacts** of the deliberations are difficult to assess due to lack of data, specified goals, and information about dissemination activities. Therefore, **to assure actual impact on decision-making, a description of how the deliberative process is going to influence policy-making should be made.**

The NANOPLAT project developed a case for a more permanent form of deliberation to be necessary for enabling an **ongoing process of collective responsibility**. The consortium developed an online tool for the deliberation on consumer products, which might serve as a starting point for this process. The challenge was to have more deliberative processes organised on different technologies by reducing the costs of the deliberative process and make them more accessible and international through on-line tools. The argument of the NANOPLAT consortium for the necessity for more permanent and economical forms of deliberation is also reflected in the 2009 Communication of the European Commission[3]. NANOPLAT developed a **web-tool platform for stakeholders to exchange opinions and offer expertise on the ethical foundations of nanotechnologies and how they impact society**.

The NANOPLAT consortium considered Cohen's four criteria for **ideal deliberation** as a starting point[4] to transfer deliberation to an online tool. These criteria are that: (1) It is **free** discourse; (2) It is **reasoned** and require reasons supporting proposals; (3) Participants are **equal**; (4) It aims at rationally-motivated **consensus**.

The proposed deliberative process developed by NANOPLAT[5] is based on two steps: the kick-off session and the open revision session.

[2] SIFO website: https://www.hioa.no/eng/About-HiOA/Centre-for-Welfare-and-Labour-Research/SIFO/Presenting-SIFO
[3] Nanosciences and Nanotechnologies: An action plan for Europe 2005-2009. Second Implementation Report 2007-2009, Brussels, 29.10.2009, COM (2009) 607 final.
[3] http://ec.europa.eu/research/science-society/document_library/pdf_06/understanding-public-debate-on-nanotechnologies_en.pdf

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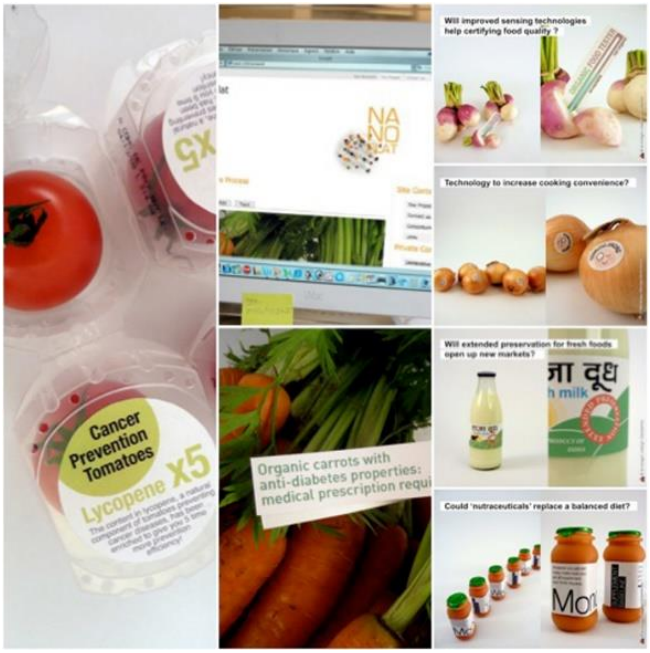
**1. Kick-off session:** The purpose of the kick-off session is to prompt the emergence of key issues involving a reduced circle of experts in a quick interaction process. These sessions were based on short online conference and a chat-like tool (regular key-board based - no audio or video) allowing short written fluid exchanges between 5 to 10 participants. The purpose of such a setting was to slow down exchanges between potentially antagonist parties on burning subjects. Body language and tone of voice don't appear, and mood is indicated only through the inflexion of written formulations of positions. On the other hand, written contributions essentially require more rational thinking and text is perceived as less volatile. Taken together, the effect of this kind of interaction is to direct participants towards a more reasoned debate, balancing the dynamics of a round table discussion with the argumentation of the written paper and thus meeting Cohen's 2nd criterion (reasoned deliberations). The result is an **8 to 12 pages written dialogue,** produced rapidly (in about 30 minutes) that remains available online as an evidence of the exchanges. It is also a ready to use material to prepare a synthesis for the next step.

**2. Open revision session:** The purpose of the open revision session is to facilitate the emergence of an agreement within a larger circle of stakeholders. This second type of session is based on free access online revision of synthesis emerged from the kick-off session. The process was based on a wiki-like tool displaying the synthesis and offering to visitors the possibility to edit them and substitute —as there was no comment box— the former version by a new one. The tool also offers the history of all previous versions, the possibility to restore them, to compare between different versions and evidences the changes that have been made.




The effect of this type of interaction is to facilitate consensus and thus to meet Cohen's 4th criterion (consensus). The log of visits allows the moderating institution to easily follow the number and type of visitors, and to acknowledge their agreement to the synthesis (whether they make changes to its text or if they simply read the text and approve it). The result is the last version of the synthesis, which has been agreed by all participants. Two other important settings of the platform must be mentioned in order to show how it meets Cohen's final two criteria. These are: *(1) invited visitors* or stakeholders are invited in generic terms, without mentioning their identity leaving them free from undue influences (Cohen's 1st criterion: free discourse) and (2) *anonymous participants* whose identity is not disclosed to one another (Cohen's 3rd criterion: equality amongst participants).

The deliberation among production-consumption-governance actors was semi-directed by an independent promoting institution, that played a key role in defining the framework of the deliberation. This **independent organisation** recruited the participants and monitored the process, ensuring the engagement and proper implementation of the process with the required neutrality and independency from the players. The NANOPLAT platform supports the process but will always require a moderating independent institution to

[5] *Understanding Public Debate on Nanotechnologies Options for Framing Public Policy, chapter 5,* http://ec.europa.eu/research/science-society/document_library/pdf_06/understanding-public-debate-on-nanotechnologies_en.pdf

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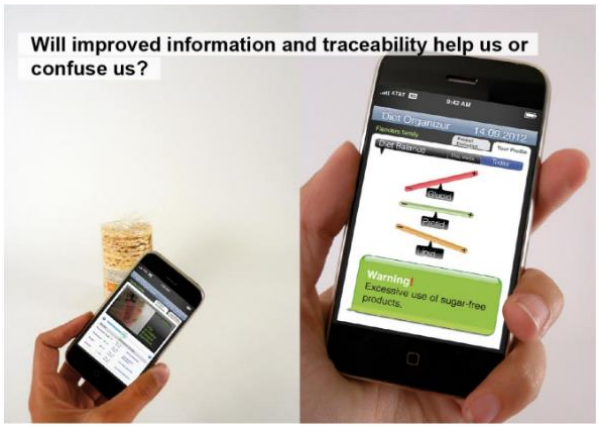
bring the deliberative process forward and represent a trustable and reliable party to conduct these tasks in the eyes of all the stakeholders concerned by the deliberation.

## NANOPLAT pilot experiment




The simple online tools developed by NANOPLAT facilitated the discussion between remote stakeholders involved in the same nanotech sector. The pilot experiment of the platform was conducted on food and nanotechnology such as: enriched tomatoes preventing cancer, long conservation fresh milk, tearless onions, etc. The objective was not to be exhaustive on the topic, but rather to experiment the platform, explore its potential and point possible improvements.

Briefing documents on the topic were elaborated to introduce to the semi-directed online debates, giving the theoretical framework and synthesis of the main issues in order to facilitate discussions and give an equal knowledge among kick-off sessions participants. Different mock-ups of future food products were extrapolated from scientific conjectures circulating in the media. The resulting series of 12 slightly challenging visualisations were used to stimulate debate on the platform on both likelihood and desirability of such food.

Two kick-off sessions were organised, with 4-8 representatives of each of the different stakeholder groups (industry, government, NGOs, public authorities, etc.). Invitation mails outlined how the debate would be organised in 2 hours meeting period. It was required for each of them to send back a few key issues they would like to debate. This resulted in 6 - 8 key issues obtained by clustering the questions that were submitted. Participants confirmed their interest in taking part of the process (Cohen's criteria of free participation) and received an answer stating the roles of the stakeholders (anonymous) which would be part of the debate. They were assigned usernames and passwords identifying their role but not their personal identity i.e. 1_business 1; 2_research; 3_ngo; 4_authority, etc. Guidelines and rules of participation were presented to the participants, in particular to ask them to **systematically justify** ("give reasons for", "properly explain") their answers (Cohen criteria of reasoned discussion). During the 2 hours meeting, the participants logged onto the platform and one of the consortium members acted as moderator. The key issues were debated for 10-20 minutes each. After the session, a one-page synthesis on each of initial issues was produced by the consortium. This session was very productive, avoiding the presential meetings and learning processes usually associated with deliberative processes. It proved an easy and effective way of collecting information from the different stakeholders in a short time.

For the second-step, each synthesis of the emerging issues was posted on the NANOPLAT platform via a wiki-based tool. Invitations were sent by mail to the kick-off session participants, to the observers of the session, to interested stakeholders that were not available for the kick-off session and in general to a larger range of production-consumption-governance actors of the focused topic. In total 60 invitations were sent, proposing to check each of the issues and eventually revise the related synthesis. The invitations explained that the synthesis would be made public to incentive participation. The consortium monitored the revision process, prompted participation and avoided interventions that were deemed too radical. Of the 46 persons invited to take part, 15 effectively logged on the website over a one-week period. The level of feedback of 33% was particularly high, especially considering the very short time left between the invitations to the sessions to allow

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time for the high-level experts to consider that the synthesis have been validated (Cohen criteria of reaching a consensus).

This experiment was too short to draw in-depth conclusions on the platform. More piloting on a larger sample of stakeholders and different topics should be run to confirm the first results. However, it is clear already with this experiment that an online deliberation platform is a promising solution to promote a regular dialogue between various actors of the nanoscience and technology development in Europe and beyond.

## The future of deliberative processes

In the NANOPLAT overview of selected deliberative processes, a general observation was that over the years there has been a development of these initiatives, manifested also by an increase in resources and an evident sophistication of the applied methodology. A few problems arose related to the replication of results and that deliberations would raise expectations that would not be met by the political bodies. There were also concerns about the democratic process, if decision making was moved from elected bodies to non-representative ones.


NANOPLAT proposed to add visual and tactile forms of representation of hypothetical products to share scenarios that may result from the deliberative process to stimulate novel insights. This was applied to the third generation of deliberative processes, characterised by having a more specific focus and being closely and/or clearly linked to the decision-making processes, such as the NanoDiode project (2013-2016) in which they tested the methodology on stakeholders in a series of deliberations in Norway, the Netherlands, Germany, France, Austria and Italy.

The deliberative processes represent a democratisation of science and do not represent a threat to democracy, if a clear line is made between public discourses and formal decision-making processes. The simple on-line tools can save time and resources, allowing very busy people from many different countries to participate in a deliberative process amongst stakeholders. It was felt that **in the case of societal engagement of citizens, a presential deliberation process is preferred**. This is because of the important learning experiences and training that are provided to the participants.

We can conclude by referring to the recommendations given in the final NANOPLAT report on including discussions on ELSA aspects within emerging technologies. Before starting a deliberative process, it important to clarify the following questions: (1) **Be specific**: Choose relevant technology and possible specific applications; (2) **Be political**: Link the deliberation to the decision-making processes; (3) **Be responsible**: Choose an independent institution to run the process.

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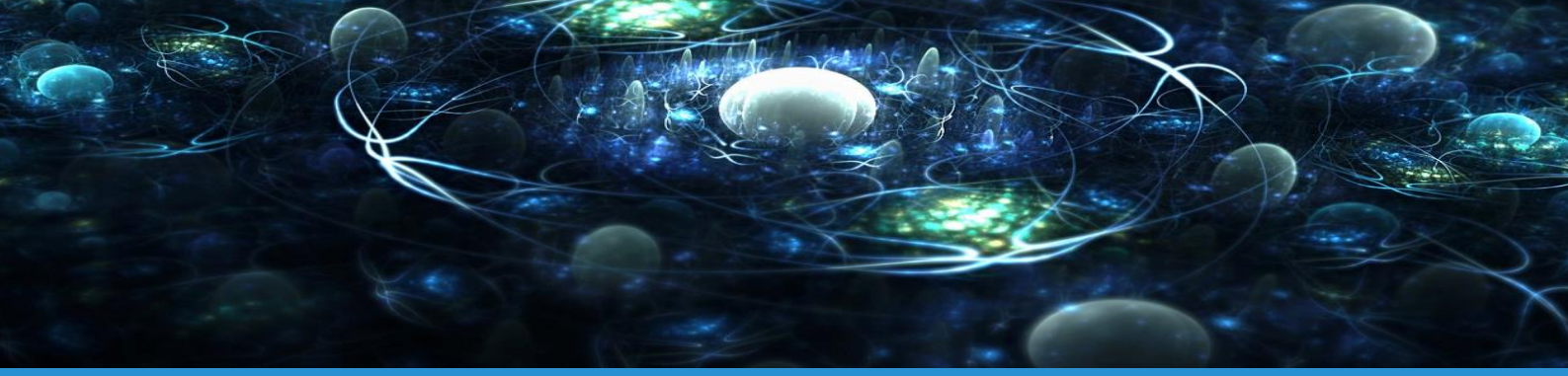

# Responsible nanotechnology R&I – Societal engagement practices

# TIME for NANO

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RRI is an approach that anticipates and assesses potential implications and societal expectations with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1] . As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations (CSOs), consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the **TIME for NANO Project**, a 30-month project run by partners in 9 EU countries and financed by the European Commission under FP7 - NMP. The aim of the project was to engage the general public, with a special attention to young people and future potential researchers on benefits and risks related to nanoscale research, engineering and technology, through specific informal education products. Data for this report was gathered via desk research and through structured interviews with Anne-Marie Bruyas and Alessandra Drioli from Fondazione IDIS-Città della Scienza which was the coordinator of the project.

## Time for Nano project

**TIME for NANO - Tools to increase mass engagement for Nanotechnology**, funded under FP7-NMP - Specific Programme "Cooperation": Nanosciences, Nanotechnologies, Materials and new Production Technologies, is a 30-month project which started on February 2009 and ended on July 2011. It was coordinated by Fondazione Idis-Città della Scienza, based in Italy. Città della Scienza is a non-profit organization specialized in dissemination of the **scientific and technological culture**, as well as in educational and business systems. One of the main values of Città della Scienza is to set up a new scientific citizenship, filling the gap between science and society, in order to bring the science out of laboratories through an open dialogue with citizens and stakeholders, create an efficient relationship between science, innovation and society for the economic and social development of the region and foster social inclusion through social innovation.

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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The TIME for NANO project addressed a major challenge, applying to any emerging technology: the fast development of nanotechnologies is raising radically new public policies **fostering upstream citizens' participation in the debate about the governance** of these emerging issues. Therefore, the project was **designed to ensure that nanoscience and nanotechnology (N&N) research activities would be made comprehensible to the public and even more should respect fundamental rights and be designed, conducted, implemented, disseminated and used in the interest of the well-being of individuals and society**. The initial objectives of TIME for NANO can be divided into three broad categories: 1. Implement innovative tools to engage young people, 2. Communicate on five key issues (the "nanodilemmas"), namely **health, privacy, environment, socioeconomic divide and improvement**[2] and 3. Develop a community. Those objectives were addressed through three types of action: outreach, **dialogue** and education.

The **dialogue activities** can be seen as the project's central activities, with a heavy focus on the primary **target audience** of the project, i.e. young people. The aim of these activities was to fully engage young people in the issues at stake in N&N. Teachers were an indirect target group. The general public and professionals were strictly secondary and although few of the project's dialogue activities were targeted at these groups, a significant number still participated.

## How did it work?

TIME FOR NANO project implemented and employed creative ways of raising awareness and interest in nanoscience among young Europeans. Those instruments helped in providing an adaptable model for communicating the nanoscience to young people. **There were two central dialogue-based elements to the TIME for NANO project: the Nanokit activities and the online video contest**. The Nanokit[3] is a box containing 10 hands-on activities, introducing nanotechnologies and potential applications, to be carried out using real nano materials - as 'magic sand' and 'hydrophobic textiles' - scripts for experiments and the PlayDecide game[4]. It was a tool for stimulating the participation of youngsters in the nano-olympics and for engaging in debate scientists, stakeholders and the public in general. The kit was conceived to have an impact on three levels of information: it stimulated the cognitive level, it influenced the experiential knowledge and it triggered the socio-political knowledge, stimulating discussions on how "good" nano activities can be. Such discussions proved to be extremely engaging for the public. 1000 editions of the Nanokit were distributed throughout schools and science centres where they were also used as a tool for the Nanoday events (central outreach activities of the project) and to increase the involvement of young people in the online video contest.

The **international online video contest**[5] aimed to engage young people in N&N by encouraging them to create short videos communicating one of the five ethical issues in an innovative and creative way. The contest was heavily promoted by project partners across their vast networks of schools, through project activities. This produced a real engagement with many complex issues related to N&N in the classroom and in science centres and museums as students got to grips with the five nanodilemmas and came up with ways to communicate them

[2] The five nanodilemmas:
- Health: Nanorobots inside your body: "cool" stuff?
- Privacy: Tagging the whole world?
- Environment: Mending or harming the living world?
- Socioeconomic divide: What do you get if you can't pay?
- Improvement: What nano-powers would you choose to have, and why?

[3] https://www.ecsite.eu/sites/default/files/nanokit.pdf

[4] This is a card game for fact –based group discussion, already known for its effectiveness in triggering debates and discussions among the participants. The game was adapted for the Nanokit and for young people above 12 years old. The last part of the game has been modified so as to introduce the nanodilemmas and to trigger debates around these issues.

[5] https://www.ecsite.eu/activities-and-services/news-and-publications/participate-second-edition-time-nano-online-video

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to their peers through the medium of video. The online video contest encouraged ordinary young Europeans to become budding amateur filmmakers and produce YouTube videos exploring nano-related themes. During the lifetime of the project, more than 200 entries were uploaded.

A **web platform** was created to be a resource centre and an attractor for the whole community of N&N communicators, through its contents (continuous addition of new information etc), its innovative tools (web contest), the artistic approach and the online feedback collection. The central outreach actions of the project were the **Nanoday events. Those events** aimed to engage young people, with the help of science communicators and researchers.


A great added value of the project is that of "growing" a community of people engaged in N&N communication. Through the **implementation of training courses in each of the participating Science Centres (at national level) and by Ecsite[6] (at European level)** the project reached a number of at least 450 multipliers (experts working in outreach and education efforts), carefully chosen among three main groups: explainers in science centres and PhD students in science communication; teachers from primary and high schools. The public participation to the web-contest was ensured by the organisation of many events in science centres of 9 countries each year: launch event, nano days, final event with award prizes, intended as occasions for informing/educating, on one hand, and for engaging youngsters, collecting perceptions and opinions, on the other.

## Project Results

The **Nanokit** was clearly one of the project's great successes. The feedback on the kit, from project partners, from users of the kit, from teachers and other professionals being trained and from the young people taking part in the tool was virtually universal acclaim for the quality and its innovative nature. Many more Nanokits were requested than it was possible to produce within the limitations of the project; a testimony to the usefulness of this tool.

The project consortium rose to the challenge of how to engage young people in the contest. The choice to focus on five key areas ensured that young people engaged directly with five topics which are particularly relevant to their daily lives, and which raise interesting ethical, legal and social questions.

The **online video contest** was an innovative and creative means by which to engage young people in N&N. The impact of the video contest is felt not just in the significant number of entries into the contest Europewide, but also in the numbers of views the videos have received on YouTube, and in the positive feedback the contest received from schools and young people. The result of the video contest is not just the deep engagement and dialogue that took place during the project but also a produced set of resources that can be used by educators and science communicators on the long term.

According to an interview-based evaluation of the participation in the video web contest, it seems that the opportunity to ask questions on N&N to teachers or explainers at a science centre is fundamental to make young people aware of N&N research and its impact. The web platform works well to provide contest participants with in-depth information on N&N. School plays a big role in stimulating interest in the topic of N&N. Nevertheless, a lot of information on N&N has been taken on students' own initiative, according to web contest participants.

The **multipliers' training** was the key to ensuring the project's lasting impact. These training courses ensured that teachers and science communication professionals knew how to work with the Nanokit itself, but more importantly how to address controversial ethical, legal and social aspects like the five nanodilemmas. The result is a European network of nano communicators, in contact with each other both on a local level and a European level. The multiplying effect of this type of activity is difficult to measure, since by its nature it fosters the

[6] The European Network of science centres and museums

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development of collaboration between professionals in an organic and spontaneous way. What is certain is that each of these professionals will come into contact with many hundreds of young people, using the expertise from the training course to engage them in nanotechnology and nanosciences.

The quantitative data coming from the entry and exit questionnaires show that there has been a significant cognitive output for young people involved in the activities scheduled within the Nanodays. After taking part in the workshops, more than **80% agreed that they had learnt about the consequences of N&N on everyday life**. These data show that there has been a significant learning output in terms of raising awareness about the implications of nanotechnology: the activities performed during the Nanoday allowed participants to learn more about N&N and its effects.

The result was also **a total of 207 videos uploaded to YouTube** by young people, which also serve as an excellent tool to engage other young people on nanotechnologies and **which have attained over 30 000 views during the project alone.** Overall, participants involved in discussion groups, seemed impressed by the opportunity to find connection to **their own everyday lives**.

Outreach target audience involved were young people, general public, professionals and teachers from local region. Overall, 20,000 people attended the Nanoday events, 117 entries received from the online video contest, 11,000 visitors and 45,000 pageviews for the webplatform, 25 trainings for science communication professionals and explainers from science centres and museums.

## Conclusions & Recommendations

Time for Nano identified the following key conclusions and recommendations for engaging young people in a constructive dialogue on nanotechnologies:

Engaging society is a slow and difficult process and it requires time. In most RRI societal engagement projects, industry and the academia have a heavy presence while CSOs are maybe engaged if the topic is controversial enough. **TimeforNano confirmed that nanotechnologies are unknown to the general public and faced the difficulty to involve people, given the complexity of the issues**. However, the project results and impact inspired a reverse of that trend by raising the issue of "how to successfully communicate the complexities of N&N" which is essential in order to engage people. In this context, **the project highlighted how important it is to address mainly young actors, who are not touched yet by politics that may influence their way of thinking and who are capable to adapt better to novelties**. This is why there is a need for long-term projects capable of enabling students to form a well-informed opinion on nanotechnologies, their broader societal impacts and the assessment of foreseen benefits and risks.

The project showed an **urgent need to engage young people on the ethical, legal and social aspects of N&N** with a focus on the issues of energy and environment as well as the practical uses of nano-innovations such as water, surgical devices, textiles and cosmetics and medical applications. What also became clear is the need to **train or recruit study support personnel** with sensitivity to the challenging questions of nanotechnologies. Further to that**, involving the policy makers** (at any level) and convincing them that investing on nanotechnology can bring them consensus is a preliminary step for a structured dialogue.

**The communication of N&N needs new "languages" with which to engage the public**: media, arts and games, especially when the target is young people. The nanotechnology sector should be proactive in collecting suggestions for nano development from the public. There is also a **need for more popular experiments on nanotechnologies**, in order to strengthen connections with schools, and the development of public engagement activities, exhibitions and other products. There is a compelling **need for public debate on specific case studies**. In addition, the role of media is essential in order to define the agenda about nanotechnologies innovations.

One of the objectives of the TIME for NANO project was to develop a growing community of people interested in Nanotechnology. The project succeeded in involving a community of different audiences through activities that managed to involve, among others, museums, institutions, research centers and centers of excellence. The organization of big public events helped in engaging not only stakeholders, but civil society as well.

The Nanokit was initially tailored to be part of the school curriculum, but it can go further by addressing other scientific issues. **If incentives and platforms for interaction are given, the public debate on nanotechnologies could be performed at higher educational levels**. After all, when the Nanokit was presented to Academics it

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received a rather positive feedback. In terms of sustainability, the Nanokit, as well as the rest of the project tools, was designed to be used in the long term. **It could ensure a great degree of inclusiveness and the participation of a diversified audience, provided that the contents are regularly updated and adapted to different themes so as to keep up with the nanotechnology diverse challenges**.

Overall, **the facilitation of debate on nanotechnology within the education institutions could foster a participatory culture and increase public debate in general. However, much depends on the sensitivity of the actors interested in the subject and their policy priorities.**

Città della Scienza still practice in their science centre the activities implemented with The Time for Nano Project showing important results in societal engagement.

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# Responsible nanotechnology R&I – Societal engagement practices

# Multistakeholder Dialogues

## Introduction

**NANO2ALL** is an initiative funded by the European Union's Horizon 2020 Research and Innovation programme under the Grant Agreement Number 685931. It supports the establishment of Responsible Research and Innovation (RRI) policy and governance on nanotechnologies. NANO2ALL also aims to identify RRI practices, with a focus on societal engagement in nanotechnology research and innovation (R&I) across Europe and beyond, with the purpose to share knowledge, experience and recommendations with other nanotechnology stakeholders and motivate a wider application of such mechanisms in Europe.

RRI is an approach that anticipates and assesses potential implications and societal expectations, with regard to R&I, with the aim to foster the design of inclusive and sustainable R&I[1]. As a dimension of RRI, societal engagement implies interactions between relevant stakeholders (companies, research organisations, policymakers, civil society organisations, consumers, affected citizens and others) in order to align research, development and innovation with the values, expectations and needs of the society. Such interactions can take various shapes, such as brainstorming, scenario workshops, user committees, online forums, dialogues, informal / formal meetings, or other formats.

This short report provides brief insights into the NANO2ALL Multi-stakeholder Dialogue organised at national and European level. During these events participants discussed how societal values, needs and concerns can be better reflected in nanotechnology research and innovation, in particular through an increased uptake of societal engagement in this domain of research and innovation. These dialogues resulted in several recommended directions for changes to be enabled by decision-makers at national and EU level.

## Methodology

NANO2ALL employed a three-step dialogue methodology that consecutively encompassed the organization of national citizen dialogues and national multi stakeholder dialogues in six European countries (France, Israel, Italy, Poland, Spain and Sweden) and the organization of a final European stakeholder dialogue event (in Brussels, Belgium) between 2017 and 2019 (Figure 1). Each new dialogue phase built on the prior one, i.e. the outcomes of citizen dialogues served as input for the national multi-stakeholder dialogues, and the outcomes of the national stakeholder dialogues served as input for the European dialogue event. In this report we chose to focus on the two final dialogue phases of our methodology which are further elaborated into national and European Responsible Innovation Agendas.

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

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The dialogues allowed for deliberation of values and purposes underlying a responsible technological future for nanotechnology, and resulted in the articulation of those processes and preconditions that are needed for the development of socially robust and responsible nanotechnology applications. The described processes and preconditions may serve as an agenda for responsible nanotechnology policy-making as well as research and innovation in the nanotechnology community, both at national and EU level. A final step was taken to translate this agenda into a roadmap that presents an action plan to enhance societal engagement in nanotechnology.

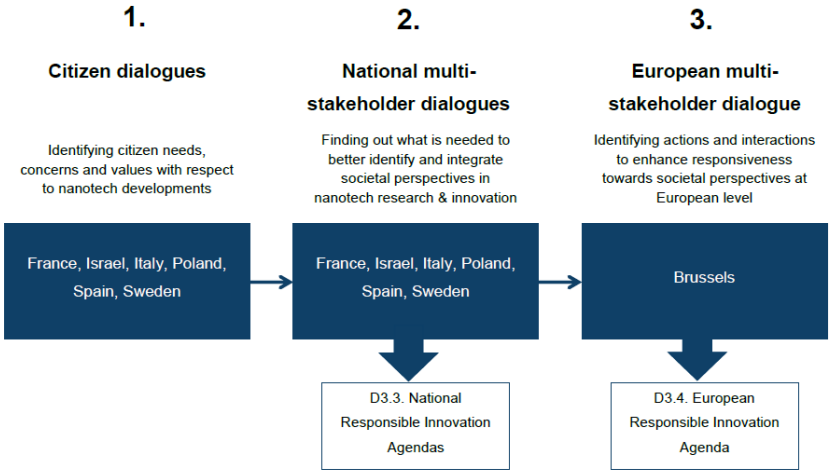


*Figure 1 – Overview of the NANO2ALL three-phase dialogue methodology*

## National Multi-stakeholder Dialogues

The national multi-stakeholder dialogues were conducted as a 7-hour event with approximately 15 participants.

The six National Multi-stakeholder Dialogues aimed to explore both the dynamics of change, as well as future options and challenges. The dialogues allowed to create a shared understanding of stakeholder perspectives on purposeful change, particularly about the processes and preconditions that are needed for the development of responsible and desirable nanotechnology research and applications. This allowed for the collaborative construction of a national responsible innovation agenda. The various dialogue exercises were also aimed at establishing mutual understanding and learning, and also encourage the consideration of citizen perspectives that were expressed in the national citizen dialogues.


*Figure 2 – Scenario exploration at the Swedish Multistakeholder Dialogue*

The dialogue participants were recruited by local science centres, who hosted the dialogue sessions. The project aspired to bring together heterogeneous groups of approximately 12 participants, having diverse views on the topic of the dialogue. A guideline was provided on what types of stakeholder groups should ideally be included in the dialogue process including:

- Policy-makers
- Civil society organizations
- Business and industry representatives

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- Nanoscientists
- Citizen dialogue representatives
- Non-fixed position (actors that do not have a formal stance with regard to nanotechnologies, such as a journalist or an artist, and who can, therefore, bring new perspectives to the discussion).

The dialogues explored particular nano-application fields (Nanotextiles in Poland and Italy; Brain-machine Interfaces in Spain and France; Nanomedicine in Israel and Sweden) and applied a three-block methodology, as illustrated in Figure 3.

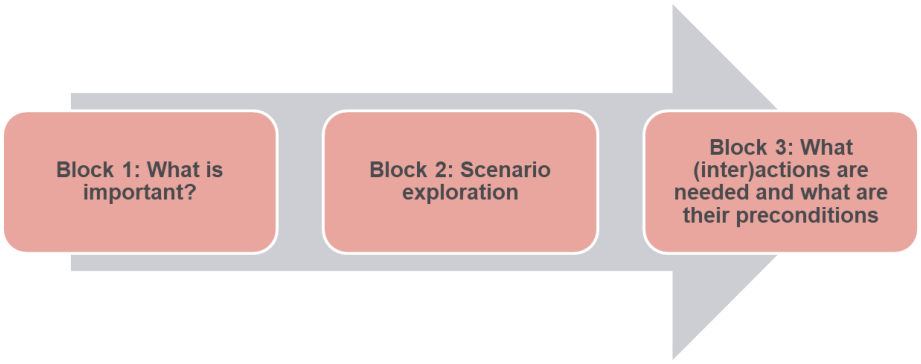


*Figure 3 – National Multistakeholder Dialogue methodology*

1. The first block constituted a reflection exercise upon citizen needs, expectations and values identified in the previous national citizen dialogues in each country and allowed deliberation over what is important / what is at stake for citizens when it comes to specific nanotechnology applications. These citizen perspectives were introduced in the dialogues through illustrative posters (available at http://www.nano2all.eu/made-by-citizens-objects/).
2. The second block of the dialogue was the Scenario Exploration Game. It is a tool that allows participants to playfully experience and act through alternative futures, by thinking and discussing outside of their usual frame of reference (SES game materials are available at: http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/)
3. Finally, in the last block, participants worked in pairs and groups to discuss (inter)actions required to better identify and integrate societal perspectives in nanotechnology research and innovation. The methodology used was a backcasting exercise that helped identify actions and approaches that connect desirable futures to the present.

The outputs of the national multi-stakeholder dialogues are six national responsible innovation agendas and can be consulted at http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/. These agendas provide a short description of the directions for change that allow nanotechnology research and innovation to be more in line with the values, needs and concerns of both citizens and stakeholders.

## European Multi-stakeholder Dialogue

The European dialogue was a one-day event structured according to a dialogue format that consisted of five main exercise blocks (Figure 4). The two morning exercises were of an exploratory character, focusing on the concept of responsiveness

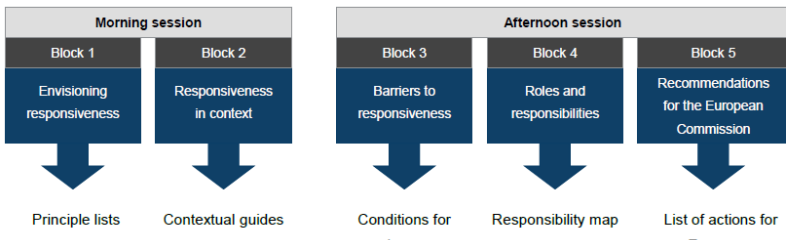


*Figure 4 – Five Exercise Blocks*

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and what this concept would look like in different future worlds and different nano-enabled application scenarios. The three exercises in the afternoon concentrated on the identification of concrete actions that are needed to make the nanotechnology research and innovation system more responsive and on formulating recommendations to the EC.

The NANO2ALL project carefully selected relevant stakeholders for the European Dialogue event. The project made sure that the group of dialogue participants varied in terms of backgrounds and perspectives on the dialogue topic. Several participants from previous national dialogue events were also invited to allow inputs from the national dialogues to reach the discussions at European level. At the end, 29 participants attended the dialogue including Nanoscientists, Policy-makers, Industry, CSOs, Intermediaries (including media, RRI experts, ethicists and social scientists) as well as national dialogue participants. Gender balance was also considered when selecting the dialogue participants. At the discussion, the participants consisted of 15 men and 14 women.


*Figure 5 – Exercise 2: Responsiveness in Context*

The dialogue participants were divided into six groups for the first exercise block to discuss the question "What would responsiveness look like in different future scenarios?" Each participant group explored a future scenario (for the year 2050) depicted on a mood board and used Lego, drawing, and writing materials to "build" responsiveness into that particular world. Subsequently, each group condensed their outputs into a list of principles of responsiveness. These lists of principles were displayed around the room and participants were asked to take a look at each of them and individually write down the three principles they themselves found most important.

*Figure 6 – Exercise 3: Barriers to Responsiveness*

In the second exercise, the participants formed new groups and collaboratively explored what their most important principles would mean in the context of narratives around various hypothetical nano-enabled applications, which were visualized on A0 posters. Questions including Who should do what? When? And for what reason? were discussed and debated. These details and discussion points were written down on sticky-notes and added to the poster sheets, resulting in so called "contextual guides".

In the third exercise, participants grouped together in their own stakeholder groups to which they assigned themselves. The different stakeholder groups brainstormed about their experienced barriers to bringing responsiveness into practice and considered what would be needed to overcome these barriers.

In the fourth exercise, the participants mixed into new groups in which the different types of stakeholder categories were combined. Participants exchanged what actions they considered necessary to enhance responsiveness in the nanotechnology research and innovation system. Each participant shared what actions he or she wanted to undertake him/herself and what actions they felt other actors could undertake.

Finally, the workshop concluded with a plenary session in which participants shared some main insights based on their workshop experience and suggested specific recommendations for the EC. More on the dialogue outcomes and methodology can be found at: [http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/](http://www.nano2all.eu/resources/nano2all-dialogue-materials-and-results/)

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# Reflections and recommendations

## National Multi-stakeholder Dialogues

The NANO2ALL project developed an interactive dialogue format that aimed to establish an open and stimulating dialogue environment, in which participants could freely share their opinions and learn from each other's perspectives. From the feedbacks it stood out that all dialogue sessions were characterized by a lively atmosphere, in which participants wanted to contribute actively to the discussions. The events did not only trigger valuable discussions on societal engagement in nanotechnology R&I, but also proved an excellent opportunity for participants to network with people from other sectors. The dialogues were thus an important capacity building activity in itself, in the sense that they connected (societal) actors and stakeholder groups that could collaborate in making nanotechnology R&I more inclusive. The 8-hour duration format, however, asked for substantial efforts of participants to remain focused throughout the entire day.

## European Multi-stakeholder Dialogue

The organizers of the workshop aspired to work with a stimulating and playful dialogue format that would fuel significant interaction and reflexivity concerning the roles, responsibilities and practices of the different actors and the concept of responsiveness itself. The responses in the evaluation questionnaire showed that many people appreciated the "creative" dimension of the format and referred to the dialogue as "fun" or "stimulating". Generally, the participants seemed more positive about the second half of the event (i.e. working towards recommendations) than the first half (explorative). Participants valued hearing other perspectives on experienced barriers to responsiveness and required actions to overcome these. A final point of reflection on the dialogue format relates to the organizers' choice to not give participants a clear definition of responsiveness up front. Instead, the different interpretations of responsiveness were collectively explored by participants in the first half of the dialogue, resulting in a broader and more diverse overall idea of what the concept is about. The advantage of this approach was that it provided space to become aware of the plurality of underlying perspectives and assumptions that play a role in many of the discussions in RRI contexts. Such awareness could help participants to understand where different points of view with respect to concrete recommendations for change stem from. However, the broad interpretation of responsiveness also allowed people to just focus on one particular aspect of the concept that interested them most, resulting in discussions in which participants did not always respond to each others' statements or talked at cross purposes.

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# Responsible nanotechnology R&I – Societal engagement practices

# NANOCUBE

## Introduction

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The activities of NANO2ALL include the collection and showcasing of best practices of implementation of RRI by governments, civil society or the industry. One of these practices is the NANOCUBE project to which this report is dedicated. NANOCUBE is a project which was coordinated by the companies ARCHA and TECHA for the development of dermo-cosmetics and biomedical applications based on the use of nanomaterials. The H2020 RRI-PRISMA project supported ARCHA and TECHA to integrate principles of RRI in the development of NANOCUBE, addressing ethical and social implications arising with the development and use of nanomaterials in cosmetics, especially citizen concerns on the risks for human health, issues of risk perception from both the public and professional stakeholders, and questions as to the added value and efficacy of these materials.[2] Addressing these questions throughout the process of product development is deemed to be essential for businesses aspiring to integrate aspects of RRI into their R&D. This is to the benefit of the industry, to ensure

[1] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/responsible-research-innovation

[2] RRI- PRISMA project blog, Porcari A. (2018), Nano in cosmetics: an industry case of RRI implementation, https://rri-prisma.com/2018/10/08/nano-in-cosmetics-an-industry-case-of-rri-implementation-post-by-andrea-pocari/ (accessed 8 February 2019)

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acceptability of the final product, as well to address existing legal requirements for the integration of nanomaterials in cosmetics.[3]

This report briefly defines the RRI concept in the context of NANOCUBE, describes the stakeholder engagement process as it was implemented within NANOCUBE and presents recommendations towards other actors interested to implement similar activities. The report was developed based on Deliverable D2.4 of the PRISMA project, desk research and a short interview with Andrea Porcari of Airi (Italy), partner of PRISMA.

## RRI at ARCHA SRL and NANOCUBE

ARCHA SRL is an innovative SME which operates in Italy and performs applied research to "provide assistance, technological innovation and know-how to companies to enable them to produce while respecting man and the environment, and to work in compliance with moral and ethical principles"[4]. The fact that RRI is embedded in the mission of ARCHA is further demonstrated by the fact that it implements in its research and innovation processes different certification procedures, regarding in particular health and safety at the workplace, social accountability, environmental and quality management. The participation of equal number of women and men in product design and development, and the incorporation of the gender dimension in all phases of R&D are also a cornerstone of ARCHA activities.

In the case of NANOCUBE of ARCHA and TECHA (a subsidiary of ARCHA) the role of PRISMA was to provide advice towards fostering RRI in the entire product development process, ensuring in particular that the precautionary approach and the principle of "safe by design" are applied. The broader purpose of the cooperation with PRISMA, has been to integrate societal values in the final product. Such values are related to the efficacy of the product compared with existing products, safety, improved quality, affordability, safe production and compliance with sustainability norms also as regards the supply of raw materials. Additionally, the aim has been to address the concerns of societal actors about the risks posed by nanomaterials and overall about the perceived uncertainty.

## Stakeholder engagement at NANOCUBE

In the context of the cooperation of ARCHA with PRISMA on the NANOCUBE project, a Stakeholder Dialogue was carried out. The Dialogue was a one-off event that took place in Pisa (Italy) in June 2018. The event brought together actors from the entire R&D chain. The purpose was to "understand how to ensure a responsible development of nanomaterials along the R&I value chain, considering safety, quality and desirability of final products and understand how to define methods and procedures for a safe use of nanomaterials in cosmetics and medical devices"[5].

In the preparations for the event the agenda and a flyer were distributed to the participants. The day was structured in a first part with plenary lectures, and a second part to discuss RRI aspects of Nanocube, based on a draft "RRI roadmap" for uptake of RRI within Nanocube prepared by PRISMA.

The **themes discussed in Part A** "Nanotechnologies for dermo-cosmetic applications" were, **first**, nanotechnology and nanomaterials, and in particular the following topics: a) responsible research in nanomaterials, b) nanotechnology in cosmetics and in biomedical products: opportunities, barriers and prospects; **second**, dermatology, cosmetics and innovation, and in particular a) Innovative models of risk evaluation for the safety of consumers, b) prospects and market and consumer expectations; **third**, regulations and certifications and in particular: a) Regulation and standards in nanotechnologies, b) Expectations of

[3] Porcari A. (2018), as above
[4] ARCHA company website, Mission Statement, http://www.archa.it/en-US/Archa/Flow-sheet (accessed: 22 March 2019)
[5] Porcari A., email exchanges with the writer of the report

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product distributors and consumer on product quality in the world of cosmetics, c) Guidelines for responsible innovation for nanotech companies. **Themes discussed in Part B** "How to promote responsible development of nanomaterials in the supply chain of cosmetic products and medical devices: quality, compliance and certification, and communication aspects" were, **first**, The Project Nanocube, **second**, Introduction to work tables, and, **third**, the discussion table: an "RRI roadmap" for the NanoCube project.

So, the event revolved around these themes and topics, whereby some of the participants did presentations and others provided inputs during the discussion. In Part B the discussion took place in the format of the World Café, in round tables where participants were asked to provide input to the RRI roadmap for Nanocube and in particular to the social, ethical and legal aspects of nanotechnology for cosmetics and to how these aspects could be addressed by quality, certification, and communication approaches. One of the organisers from Airi was the moderator, facilitating the dialogue.

The participants in the event were around 20 and were representing the entire value chain, from the research, development stages of R&I, to producers, retailers, hospitals (for biomedical applications), certification bodies and experts in legal and ethical aspects of both nanotechnology and cosmetic research. The participants were selected based on an initial mapping of the innovation ecosystem around Nanocube, with most of them already in the network of the organisers, including partners of the Nanocube project.

Following the dialogue, a report was drafted including the presentations and the input from the World Café discussions and was circulated to the participants for review. In substantial terms, the outcomes and insights from the dialogue were integrated directly in the R&D processes of the technology developer. One of the key benefits of the dialogue was that it brought together all the key stakeholders thus allowing the company to explain the use of nanotechnologies with natural substances, and the overall safety aspects of the product. This explanation was addressed as well to the certification body for organic cosmetics that participated in the event and which took notice of the processes and assurances provided by the company, making potentially the certification process less cumbersome (this process has not been concluded yet). For the technology developer the challenge was to communicate as clearly as possible the safety assurance procedures it has put in place. The fact that the process became more transparent was particularly beneficial for and welcomed by all the participants.

## Lessons learnt and recommendations

Based on the experience of the dialogue, the organisers identified as major challenges the need to motivate people to participate, the identification of specific topics and the allocation of resources. It was evaluated as a long and time-consuming process. The feedback they received from the company was particularly positive, as they were interested in the legal and ethical aspects of nanomaterials R&I.

Key recommendations to organize similar events include:

- Prepare the event carefully to identify a focused topic and the relevant stakeholders in the innovation ecosystem of the project/product concerned.
- Dedicate enough time and resources on the preparation, management and follow-up of the event.
- Address sensitive issues (such as the reluctance of companies to disclose information about new products or processes) by creating a trusted environment and ensuring confidentiality.

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