



BUILDING ON THE STATE-OF- THE-ART: EX-POST EVALUATION ON MUTUAL LEARNING

Deliverable 1.1

GoNano has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement 768622.



Work Package:	WP1
Deliverable number:	D1.1
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Planned delivery date:	30 April 2018
Actual delivery date:	31 May 2018
Dissemination level:	PU

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1. INTRODUCTION

In order to foster responsible research and innovation in the nano research and innovation (R&I) system, innovative processes are required in order to improve the responsiveness of research and innovation processes to public values and concerns, and to enhance the confidence of stakeholders that new technologies respond to societal needs and values. The early and continuous engagement of all stakeholders is key to sustainable, desirable and acceptable innovation in nanotechnologies, in which R&I is aligned with the values, needs and expectations of society.

GoNano will co-create concrete product suggestions within the areas of food, health and energy, illustrate new opportunities for innovation and develop policy recommendations. The GoNano co-creation process aims for enhanced societal engagement in the governance of the innovation of nanotechnologies. In order to foster such an innovative process, GoNano will showcase an early state-of-the-art continuous citizen and stakeholder engagement process, building on the insights of previous EU and national projects in the field of public engagement and on an ex-post evaluation of the mutual learning process between stakeholders in previous relevant nanotechnology projects and on societal debates on emerging technologies.

The following deliverable offers a consolidation of key findings from previous and ongoing EU and national engagement projects, relevant academic literature and material from interviews with RRI experts, co-creation practitioners, risk communication experts and societal engagement experts with respect to how to facilitate and pursue a co-creation process. Projects differ according to their emphasis, e.g. on “public engagement”, “stakeholder engagement”, “co-creation” or “mutual learning”. While we acknowledge the differences that exist in these notions here, we do not engage with those differences as such.

We begin by presenting the rationale for co-creation, both with respect to the general objective of making research and innovation more responsive to societal needs and expectations, and with an emphasis on the GoNano approach to co-creation.

In carrying out a mapping and analysis of a variety of projects and initiatives, we encountered the following types of recommendations:

- How to organise co-creation exercises: substantive and procedural requirements
- Sociological/philosophical observations regarding how interactions worked (or should have worked)

The following report is structured along these recommendations; where possible, we include good practice examples of how other projects have addressed certain issues. Studies of public perception of nanotechnologies also offer some important insights for GoNano with respect to understanding attitudes to nanotechnologies and specific needs for information in co-creation exercises. We outline highlights of some relevant studies here. We then outline specific methodologies – described in the project reports – of interest for GoNano. Next we extract key lessons for GoNano from a state-of-the-art study of the public engagement literature. We then offer an overview of national nanotechnology dialogue initiatives carried out in consortium partners’ countries (see Appendix 9) and draw out the implications of these exercises for our own project. Finally, we offer a brief conclusion as to the importance of well-organised and

implemented co-creation exercises for enhanced responsiveness in the nano research and innovation system.

1.1 DATA COLLECTION AND ANALYSIS

Desk research was carried out in order to map and identify important EU and national engagement projects, particularly in the area of nanotechnology, in order to understand what drives mutual learning among different stakeholders, and to identify where and how multi-stakeholders engagement processes can be optimised for learning and responsiveness to societal needs. In total, 41 projects were surveyed, with the consortium utilising the experience and involvement of consortium partners in previous nanotechnology and emerging technology projects on multi-actor engagement. Other, relevant projects were added to this list. These projects were supplemented with relevant findings from the academic literature, along with consolidated insights garnered from national nanotechnology initiatives across five countries represented in the GoNano consortium. 19 semi-structured interviews with RRI experts, co-creation practitioners, risk communication experts and societal engagement experts offered additional insight into experiences and good practice with methodologies for co-creation with societal actors. The majority of these interviews were carried out by phone or over Skype, with interviews lasting around an hour. The interviews were recorded, stored and used in writing up the interview reports.¹ The interview guideline (see Appendix 4) was designed so as to elicit insights regarding *experiences* with engagement/co-creation/mutual learning initiatives and *suggestions and recommendations for GoNano*. Additional questions regarding the role of gender and/or diversity in engagement methodologies were included, where appropriate. Questions in the interview guideline were followed but with enough leeway to facilitate modification, elaboration and occasional digressions. Given the nature of the data - experiences of various actors with engagement methodologies - discourse analysis was not required. Coding was carried out by hand with the main themes set out beforehand in an interview reporting template (see Appendix 7).

1.2 THE RATIONALE, I.E. 'WHY' DO WE DO CO-CREATION?

In a much cited explanation of what RRI could entail, (von Schomberg, 2013) proposes:

Responsible Research and Innovation is a transparent, interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society)

Co-creation and mutual learning offer important tools and means of striving for the realisation of such a proposition. Scientific and technological advances may eventually meet a complex, global world market. At the same time, there is an ever- growing segment of society calling for such advances to be sustainable, desirable and acceptable.

However, innovators may be unaware of the implications of such demands for their developments and innovative processes. Co-creation events offer opportunities for the

¹ Please refer to GoNano D1.3 for the interview reports.

articulation and deliberation of the needs and concerns of society and can contribute to the development and embedding of new, more desirable advances. Innovators get vital feedback on their innovation processes as a result of these exercises, and stakeholders and citizen get the opportunity to voice their desires, wishes and concerns regarding the direction of research, while also learning about potential future advances.

The importance of co-creation has also been underlined in a number of projects which have concluded that action must be taken to progress from voicing alternative visions and imaginations of novel technologies to cultivating real change and impact in research and innovation trajectories. Making genuine steps from reflection to action is necessary in order to sustain trust in the research and innovation (R&I) system and to enhance the responsiveness of R&I processes to public values and concerns. Indeed, ‘responsiveness’ has been a key term in the inception of the GoNano idea. By learning from earlier projects and establishing well-thought through events, the project aims to achieve genuine co-creation and mutual learning gains, and the establishment of trust between participants. The GoNano project reverses the order of innovation by starting with a challenge or key issue in the areas of health, energy and food and then homing in on how nanotechnology might address that challenge. Through the involvement of citizens continually from the start of the innovation process, GoNano anticipates contributions that can serve to make innovation and research more socially relevant. In order to achieve such goals, the GoNano consortium needs to have the knowledge and capacity to organise a successful co-creation process.

2. HOW TO ORGANISE CO-CREATION EXERCISES: SUBSTANTATIVE AND PROCEDURAL REQUIREMENTS

The following section below sets out requirements – both substantive and procedural – necessary for the implementation of a co-creation exercise. *Substantive requirements* refer to issues such as motivation, shared goal, and the topic around which stakeholders mobilise, while *procedural requirements* address issues including appropriate facilitation, transparency, engaging modes of collaboration, and so on.

2.1 SUBSTANTIVE REQUIREMENTS

The NanoDiode² experience emphasises that **getting from constructive dialogue to practical action is a major bottleneck**; this is particularly salient for the GoNano co-creation initiatives. To encourage uptake, discussions 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? Which actions can address the issues identified during the meeting?

²From July 2013 to June 2016, the NanoDiode project (<http://www.nanodiode.eu>) organised a wide range of outreach and dialogue activities to support the responsible development of nanotechnologies in Europe. NanoDiode explored the added value of engagement activities at all levels of the research and innovation process: from policy making and research to the diffusion of research outcomes in society. The consortium brought together a range of stakeholders including industry, civil society organisations, researchers from the natural and the social sciences and artists.

Selecting the right topic is crucial, as participants need to be intrinsically motivated in order to get involved. The EU- funded Making Sense project³ is a good example here. The project aims to help citizens to use research technologies to make sense of their environments, so that they can measure pollution, water quality, sound pollution, etc. in their own environment. The use of low-cost, open source technologies allows the project to help citizens to discuss methodologies, devise data collection strategies and to interpret the results.

Additional considerations in the selection of the topic are as follows:

- Knowledge: to what extent do various publics possess general knowledge of the subject/topic?
- Maturity: to what extent have various publics already developed opinions on the subject? Has legislation been developed in the area?
- Complexity: Is the subject highly complex, such that a great deal of (technical) information is required?
- Controversy: Is the issue highly controversial and has the debate become polarised to the extent that consensus is difficult to reach? Conversely, a controversial issue may serve to facilitate or encourage the recruitment of publics/stakeholders

Seeking out a **shared goal that drives collaboration between stakeholders** is also key. The collaboration between the chemical company DuPont and environmental non-governmental organization (NGO) Environmental Defense Fund (EDF) on a risk assessment methodology for manufactured nanoparticles is a good example. The collaboration lasted for three years, with participants forming interdisciplinary project teams to work on specific problems. This worked well because it created a need for consensus, i.e. how can we move forward in tackling this problem? Participants were forced to listen to each other, to exchange ideas, work together and co-create solutions.

Building mutual trust between people and between organisations is key; people have to be open and to see the 'win-win' of open innovation and co-creation, and to trust each other. Moreover, the **willingness of all sides is important.** A partnership has to be allowed to develop; open innovation and co-creation work will take on varying levels of importance and meaning, according to the type of stakeholder involved.

Indeed, in order to foster a meaningful conversation between researchers and citizens, it is necessary to have a **matter of common concern.** Constructive dialogue emerges around an indeterminate, problematic situation – such as nanotechnology development and co-creation - that requires different kinds of expertise to define the problem and suggest possible solutions. Collaboration should take the form of a **joint enquiry** in matters of common concern. In indeterminate situations, no one has full insight into the problem at hand. Thus, it does not suffice for scientists to just explain what they are doing, as the problem also requires other forms of expertise.

³ The EU project Making Sense EU (<http://making-sense.eu/>) is a two year project (now in its final phase) which helps citizens to use academic technologies to make sense of their environments, by measuring air pollution, water quality, sound pollution etc. in their own environment.

In terms of the kinds of stakeholders to involve, the purpose of the initiative is key; if there is a genuine purpose, stakeholders can influence it. An important step involves the creation of a stakeholder map and a materiality map. Materiality addresses the question as to **who is material to the initiative**. If the focus is on nanoparticles in the environment, for example, stakeholders considered material to public confidence and trust will be environmental scientists and so on. A demographic layer can be added to that, for instance, a subgroup of people living near zones of toxic soil contamination – these people would say something about nanoparticles in the environment that would differ from contributions from people in a general urban area. Thus **the materiality of the subject to the individual is very important. So, clarity of purpose is essential.** Can we select issues about which the public is concerned and about which the information gleaned could be useful?

Defining the level of participation is important. For GoNano, this falls somewhere in between level 4 and 5 of Arnstein's (1969) ladder descriptions:

4) It is necessary to have citizens talk to each other regarding complex, value-laden issues; there is a capacity for citizens to shape policies and decisions that affect them; there is opportunity for shared agenda setting and open time frames for deliberation on issues; options generated together will be respected.

5) Organisers/institutions want to empower citizens and groups to manage the process; citizens and groups have accepted the challenge of developing solutions themselves; institutions are ready to assume the role of enabler; an agreement has been made to implement citizens and groups.

In order to ensure a sustained and desirable level of engagement, **it is necessary to address one or more of participants' motivations.** Again, the Making Sense project provides a good example of this. Three kinds of motivation for citizens to engage in the project were mentioned:

- Some people are interested in the **technology**, namely in measuring and sensing, the technologies used and the science behind it
- Some people are interested in the **environment**: they want to act on their concerns. They are motivated because these measurements can lead to better environmental outcomes
- Some people are motivated by **participation**: they want to become involved in the political/democratic process, or just want to become acquainted with people in their city.

Technology enactors such as scientists currently do not see stakeholder involvement as core business. It will only become core business if enactors see the **added value of these interactions in relation to their own goals and objectives**. This requires **compelling examples** that demonstrate how the research improved or how resistance was overcome. The FoTRRIS project found that a **positive correlation can be seen between the relevance of cooperation for a particular research field and the willingness of R&I actors to engage in collaboration**. Related to this, close collaboration with non-research actors should not put the R&I community's autonomy and independence at risk. On the other hand, in order to **motivate scientists** to participate in and engage with GoNano, it may be important to find individuals within the scientific community who want to do something that may not be immediately useful

to their own research, i.e. those scientists who are not continuously concerned about “what’s in it?” for them. Ideally, GoNano would work with scientists and researchers who are interested in collaboration whether it serves their own purposes or not, and find during the collaboration that it is actually relevant to their work. If we want to engage researchers, **it is our responsibility to demonstrate that it does make sense to look at the broader dimensions**: this can be achieved by highlighting that such reflection can help them to achieve their own goals (this is first-order learning). In order to achieve this, social sciences and humanities communities need to strengthen their ‘consultancy’ skills, and their ability to understand the context and “DNA” of the actors involved:

- **from product-driven (“here’s my theory, what do you think?”) to demand-driven: “how can I help you?”)**
- **clear and compelling examples, presented in a way that non-experts can understand**

The COMPASS project found that **RRI is not always applicable to business practices**, as business applies other concepts in its work. The project addressed this by including formats such as an RRI pitch in order to ensure accessible information for all stakeholder groups involved. **Companies that understood their core business as close to end-users or consumers (e.g. in health care) were easier to reach and to keep engaged as they could see an immediate benefit from co-creation processes**. Conversely, businesses that were more distant from end-users (e.g. companies that provide resources to the processing industry) were more challenging to reach and to keep enrolled in engagement processes. Thus, the design of processes with respect to prior interests was key. It is necessary to have some kind of internal initiative for companies and organisations to bring RRI and other issues into their development processes.

The Science2Society (S2S) project⁴ offers interesting insight into **motivations for an open innovation project**. Academia seeks to get closer to industrial contexts, for example by improving the industrial relevance of their training programmes and ensuring the societal relevance and impact of their research programmes. At industrial level, there is a clear view that innovation requires new innovation structures and strategies, beyond conventional ones. There is a need for multi-disciplinary approaches, including expertise in new disciplines that are often difficult to find in-house (with significant resources needed to build such expertise). An example can be found in the shifting of the automotive sector, from a purely mechanical to a multi-physical and -services industry, toward the broader concept of mobility. Open innovation can help to address these questions, and thus boost creativity and industrial innovation. These were the driving factors for the S2S project.

Moreover, the **COMPASS project found that the nanotechnology sector** – out of three sectors including cybersecurity and biomedicine – **was the most difficult to reach**. This is due to the

⁴ Science2 Society (<http://science2society.eu/>) is a Coordination and Support Action, piloting seven different programmes (one of which is co-creation), to boost open innovation in University-Industry-Society research. Piloting will last for a period of two years within the three-year project. The consortium comprises 18 organisations committed to implementing case studies within the pilots.

fact that the nanotechnology sector is rather diverse and nano is often an embedded element of established manufacturing (e.g. nano coatings for established products, etc.).

Defining what is at stake is key. In other words, it is necessary to have a **clear problem diagnosis**, e.g. what are the relevant issues that the technology highlights with respect to our current norms and values? Cultivating a **sense of urgency** is key. **In the case of nanotechnology, we need to ask ‘where’s the urgency?’** Why do people or civil society organisations have to respond now? **The rationale for involvement has to be made clear.** Instead of focusing on very specific nano issues or the question ‘what you think of X technology?’ – which always elicits the same response: “It sounds exciting but have you thought about the risk and how you are going to govern it, but on balance it will be interesting to see” – **the public should be facilitated to have a genuine influence on something that is important to them rather than something on which they may have no influence at all**, e.g. sunscreens and paints containing nanomaterials. The process then becomes less of a market research exercise (does the public think x or y?) and more of an opportunity to give the public a real say about governance. The PERARES project⁵ divided issues into practical themes, such as energy and health, rather than obscure nanotechnology terms and asked community groups for their views as to how solutions can be found – by using broader questions, they could zoom in on the nano aspect and start with publics’ own concerns.

A major issue in citizen consultation activities is that participants often do not know what will happen with the results of the meetings or how the project reports and/or recommendations might be used. **People who invest time and energy in such collaboration activities want to know what kind of impact can be anticipated as a result of their contributions.** The public really need to know that “you said this, so we did that”. This refers to trust/trustworthiness – people need to be able to trust that their time was well-spent by getting feedback about how their influence was or was not taken into consideration. Moreover, **people need to know that an authentic communication process has taken place, even if their suggestions were not taken into account.** If the reasons for their concerns and suggestions not being taken into account are properly explained, people tend to trust the process to a greater degree; conversely, if something was approved without feedback or explanation as to why when a focus group may have been against it, this breeds mistrust.

Clear communication from the outset is thus crucial. In order to **establish a rapport between participants in the process**, interactions would ideally take place over extended time frames, as experience from the NanOpinion project suggests.

Participants need to develop **a shared language in order to establish a successful group in which everyone understands each other**; for example, in the Science2Society project, it took time to agree on the meaning of the model of an innovation scheme, as mechanical engineers and innovation managers had completely different views on the matter. Developing a common language is a time-consuming process encompassing the joint discussion of topics and approaches, the sharing of views, contributions to project design, through playful interactions, etc. **Cultural differences should also be taken into account**; it takes time to develop and build

⁵ The PERARES project (https://cordis.europa.eu/project/rcn/94941_en.html) aimed to strengthen public engagement in research (PER) by involving researchers and Civil Society Organisations (CSOs) in the formulation of research agendas and the research process.

a common understanding for collaboration, including a common language and common expectations, even when working with similar organisations and countries.

Civil society organisations (CSOs), users and other public actors may not always be prepared to participate in policy formation. **Training and other incentives, e.g. prizes, competitions, awards, events, etc. are needed to establish competence and support for public actors' involvement in the policy-making process.** GoNano can also contribute here by facilitating the involvement of public actors in co-creation processes through enhancing the capacity of public actors to be able to contribute fully. On a more practical level, the ongoing Nano2All⁶ project demonstrates the importance of identifying existing knowledge gaps among participants engaged in dialogue processes. On the basis of this insight, targeted training on nanotechnology and RRI, and tools for facilitating dialogues and building scenarios have been developed and disseminated to participants. In addition, **expectation management** is important. All participants should be aware of what can be offered in advance, so that they know what to expect from the project, experts and intermediaries. The Nano2All project has experienced challenges in the translation between different forms of knowledge (from citizens to national stakeholders). In order to facilitate such translation, citizens' representatives were invited to participate in the stakeholder dialogues in order to clarify citizens' perspectives. This is a step GoNano might also consider taking.

2.2 PROCEDURAL REQUIREMENTS

Design thinking in order to get tangible results is important: this might include the creation of visualisations, working in interdisciplinary teams, focusing on product dimensions, playfulness in the use of engagement methodologies and building tangible demonstrations. The Nano2All project incorporated **the use of physical materials in a citizen dialogue process:** citizens envisioned the potential future development of a specific nanotechnological application and used craft materials (e.g. pipe cleaners, modelling wax, textiles, coloured cardboard, tape and plastic bottles) to build imaginary future projects within the specific application field. They were then asked to describe the functionality of the object and the potential social impact of the object. Finally, the participants identified the underlying values, needs and concerns expressed through the objects. This exercise illustrates how the use of materials in participatory activities can help participants to concretise possible futures of nanotechnological applications.

Ensure full transparency about the engagement process from the point of recruitment, including transparency about the following:

- Roles and responsibilities of all involved
- Engagement rationale (i.e. why individuals were recruited, expectations with respect to representativeness, etc.)
- Clarify how dialogues about newly emerging technologies will be linked to everyday life or personal/organisational interests

⁶ The EU-funded NANO2ALL (Nanotechnology Mutual Learning Action Plan for Transparent and Responsible Understanding of Science and Technology) is an ongoing project (Oct. 2015- Apr. 2019). With a participatory approach based on dialogue with citizens and relevant stakeholders, the project aims to enhance RRI practices in nanotechnology.

- Elaborate on expected impacts (e.g. co-shaping technologies or contributing to policies for dialogue and deliberation in civil society)

Appropriate facilitation to support the aim of the process is key – clear facilitation plans and facilitation training are important here. Attention should be paid to **potential biases of nanotechnology experts**; process facilitators should be able to guide the process and know how to provide balanced information. **The technology should not be pushed; rather, we should inquire as to what citizens need.** In order to **empower citizens to participate in debate**, it is necessary to create a level playing field, in which contributions from citizens are recognised as being as valuable as those of scientists. To achieve such a level playing field, debate should focus on product innovations in the ‘real world’. **Citizens have to be able to relate to the topic in some way.** One way of facilitating this might be to create a mock-up of a product that people can buy. People seem to appreciate the idea that they can buy something and use their power as consumers in a productive manner. The exercise should be organised such that each individual can contribute with their own specific expertise on an equal footing (i.e. avoiding the ‘teacher-student’ framing’). In addition, the NanOpinion experience emphasizes the importance of using examples relating to nanotechnology that are local and resonate with people’s interests. However, **the COMPASS project cautions that the discussion of enabling technologies – including nanotechnologies – can be challenging as these technologies are often less tangible** (generally, nanotechnologies function to improve the features of products and objects that are already being produced, e.g. through the functionalisation of surfaces). **Failing to take account of real life contexts and relevance of the research for lay participants in co-creation processes may lead to the allocation of expert research questions to lay people, thus overruling their own rationales and interpretation of experiences.** In the Nano2All project, stakeholder dialogues focused on providing input to nanotechnology policies queried the plausibility of prototypes developed by citizens earlier in the project. This came about because citizens engaged in a creative tinkering process tended to write and talk about tangible objects rather than the nanotechnology/nanomaterial aspect (e.g. they preferred to talk about brain-computer interfaces rather than the nanocomponent enabling new approaches in this field).

Overly academic debates should be avoided as important perspectives based on emotion rather than rational reasoning may be overlooked. On the other hand, notwithstanding the flattening/co-creation “we’re in this together” partnership, there are times when a mode of expression or communication is needed that involves an expert speaking and people listening. **Organisers should encourage creativity and emotions** and can do so in several ways: by clearly signalling that everybody is invited to join the discussion and that emotions and non-academic arguments are also welcome; by using innovative tools such as vignettes to present moral dilemmas; and by using genres of imagination such as theatre performances or film.

Stories and narratives offer useful means of communicating different aspects to different audiences. Narratives can differ with respect to focus, e.g. on the technology or on societal aspects. Scenarios can also be developed that focus on how people behave, along with ethical, legal and societal aspects and technological issues. These can be taken forward to include various kinds of descriptions and visualisations and used in different ways. Different scenarios can be accommodated to various stakeholder groups. An overarching scenario can be used with sub-scenarios describing the same context in a different way.

With respect to the ideal of “mutual learning”, the type, form and extent of information given to participants is highly relevant. Many events are still implicitly driven by a deficit model and include lengthy expert inputs. To avoid the risk of a top-down enforced debate, organisers could re-think the provision of informational input so as to be more interactive. Rather than assuming in advance the kind of information needed by participants and preparing expert input, participants could be invited earlier in the event to voice their information needs.

With respect to the **level of specificity required for successful collaboration** (i.e. whether GoNano should prompt citizens with a defined research topic), the level of specificity should **change over time**. In the beginning, people should feel welcome to contribute openly (ideally, including visualisations, so that they can play around with something that helps them to articulate what they want). Over time, questions should become more focused; the more focused the questions, the better the outcome. Moreover, organisers of the events should be aware of **the variety of frames in which emerging technologies are debated** and take the respective dynamics into account. By actively confronting participants with different framings of a technology, participants’ positions and underlying views can be encouraged and solicited.

In addition, **the specific dynamics of sectors should be taken into account when developing co-creation processes**, as certain aspects such as modes of communication may be not be appropriate across all sectors.

In order to get to meaningful levels of engagement, sufficient time is required including:

- time for the participants to really get to the heart of the matter: acquiring both a solid understanding of the research, and time to reflect on what the social and environmental applications of the research decisions could be, and being allowed to formulate inputs to the framing of the questions to be discussed.
- one needs to acquire ‘interactive expertise’ with respect to the disciplines.
- time to get to know each other: as individuals, but also with respect to the overall professional perspective, and broader worldviews
- time to probe how the two ‘worlds’ might connect: meaningful connections between the disciplines

The collaboration and co-creation events should be designed as a **protected space, in which there is room for experimentation**. The various stakeholder perspectives should be fairly represented. As mentioned previously, the relevance of the problem – and the engagement exercise – should be clearly communicated to stakeholders, so that they can be instilled with a sense of urgency and interest in participating in and contributing to the debate.

Flexibility in the development of the co-creation process and the opportunity to adapt the procedure were reported by both the COMPASS and SYNENERGENE projects⁷ as being

⁷ The EU-funded COMPASS project centres on the development of co-creation activities for small and medium-sized businesses to implement RRI in three emerging technology industries (nanotechnology, biosecurity and biomedicine) in order to manage their research, development and innovation activities in a responsible and inclusive manner. SYNENERGENE (Responsible Research and Innovation in Synthetic Biology) was a mobilization and mutual learning action plan (MMLAP) funded by the European Commission under the 7th framework programme (2013-2017). The project aimed to contribute to

important. Project partners appreciated having an experienced partner who pursued an open design, allowing for adaptations during the process. Some flexibility also allows for adaptation to evolving – political or societal needs – during the process.

The facilitation and evaluation of mutual learning should be made an explicit aim of any co-creation activity. In order to be able to assert something about the degree of learning that has taken place, one needs to know what the baseline is. This knowledge should be at hand when selecting the topic (see above). **Tracking and measuring the mutual learning achieved in co-creation activities is important, both for the legitimacy of the process and for the overall success of the initiative. Some projects have reported difficulty in obtaining this measurement, as there may not be any obvious ‘control group’ to evaluate against.**

Follow-up interviews following the period of collaboration could serve to document any changes in awareness, reflexivity or practice. Given that the aim of GoNano is to design a co-creation process that makes R&I more responsive, this would seem to be a crucial step in order to gather evidence that the process endures, even after the co-creation initiatives have been completed.

Organisers of the GoNano events should **actively counter the tendency to pursue meta-debates in the preparation and execution of the events.** The specific realities of nano should be taken into account. Issues such as concrete interests, the state of knowledge, materials and side-effects, regulatory requirements and so on should be taken into account.⁸ **Initiatives that focus on discussion of potential applications of nano – perhaps in relation to specific societal challenges - will be important for GoNano, in order to make the debate concrete.**⁹ It is important to **demonstrate outcomes**, so that participants can see that their contribution has been of use to society, or to the academic world, or both. This could contribute to broadening the group of people interested in joining the project. An important outcome would be to develop a concrete action plan for how to implement the outcomes of GoNano at national and EU levels in the governance of nanotechnology.

2.3 SOCIOLOGICAL AND PHILOSOPHICAL OBSERVATIONS ON HOW INTERACTIONS WORK (OR SHOULD WORK)

Actors – both publics and professional stakeholders – draw on what they are familiar with in order to understand nanotechnology. **Both public and professional stakeholder responses to and views on nanotechnology need to be understood.** Too often, the success or failure of engagement exercises is attributed to the ‘problematic nature’ of public concerns and views. On the part of publics, a lack of information about nanotechnologies tends to be compensated for through common sense, logical reasoning and analogies with other technologies (Davies, 2011). With respect to the latter, analogies – with technologies and other aspects of social life – can be used to make arguments about the potential risks and benefits of nanotechnology (Davies,

Responsible Research and Innovation (RRI) in synthetic biology by initiating and fostering public dialogue on synthetic biology and mutual learning processes among a wide variety of stakeholders from science, industry, civil society, education, arts and general publics.

⁸ Indeed, the ongoing CALIBRATE project emphasises that current guidelines and regulations for nano are not sufficient. Moreover, the project has identified unregulated areas, including end-of-life products.

⁹ The Nano2All project dialogues each focus on specific application fields in nanotechnology, i.e. nanotextiles, brain-machine interfaces and nanomedicine, in order to create a clear focus for the debates.

2011). Other discursive resources drawn upon by publics to examine uncertain technoscientific futures include personal expertise and experience and fiction and popular culture.

Professional stakeholders and nanotechnology developers also come to the table with their own assumptions and standard repertoires, which can hamper opportunities for mutual learning and co-creation. These taken-for-granted standard repertoires should be examined and opened up to debate and critical reflection by all involved. **Standard justifications of nanotechnological development** prevail in how scientists and industrialists discuss their work. The repertoires of scientists and industrialists reflect a specific perspective: that the promises of nanotechnology must be pushed and that ethics is a brake on progress. In order to enable mutual learning, it is important that these standard repertoires are opened up by facilitators in the interactive exercises.

The GoNano project can learn from **the NanoDiode project which defined three main lines of argumentation of nanotechnology in society**, linked to three ‘personas’, namely the technologist, the humanist, and the politician. Details of these lines of argumentation can be found in the table below:

	Natural habitat	Progress defined as	Society	Role of science in society	‘Involving all stakeholders’	Purpose of engagement	Relevant social concerns
The technologist	Lab/fab	Accelerate tech. development	Consumers	Science unfettered	Aligning the interests of research, industry & government	Promote acceptance by raising knowledge levels	Safety; education (workforce supply)
The civil servant	Government institutions	Economic growth	Voters	Engine of economic growth	Aligning the interests of research, industry & government	Prevent public resistance by providing balanced info.	Ensure safety to prevent a public backlash
The humanist	Social science dept./TA institute	Social justice	Citizens	Address societal challenges	Empowering CSOs & citizens to direct research	Social shaping of technology	Democracy, equality, empowerment, justice

This section underlines the various assumptions and repertoires that are mobilised in understanding nanotechnological development and its role in society. In order for mutual learning and co-creation to occur, it will be necessary to overcome – or, perhaps even merely to acknowledge – these repertoires.

3. PUBLIC PERCEPTIONS OF NANO: SOME INSIGHTS

In this section, we present key insights regarding publics' perception of nanotechnologies and reflect briefly on the implications for GoNano, in terms of specific information needs and decision-making for research and policy.

Studies consistently show that European citizens are **cautiously optimistic about nanotechnologies**: they have positive expectations, but they have also have concerns about the risks to human and environmental health and to societal well-being in general.¹⁰

The DEEPEN project¹¹ emphasized the complexity of public attitudes to nanotechnologies. A key finding from the DEEPEN analysis is that lay reactions are complex, neither simply positive nor negative but rather ambivalent. Moreover, publics are not satisfied with merely weighing up risks and benefits: “Their concerns and enthusiasms go beyond this narrow framing to encompass anything from the dangers of perfection to the problematic nature of controlling life” (p.21). **Citizens generally feel that they are poorly informed about the topic and welcome more consumer-oriented information.** The NanOpinion project¹² found that people want to be informed about whether nanotechnologies are involved in the manufacture of certain products and to have knowledge of the properties of nanomaterials of processes used. Moreover, a large majority of the 6,779 people surveyed for NanOpinion were in favour of labelling for products containing nanotechnologies. Many citizens surveyed in NanOpinion felt that the risks associated with new technologies are not sufficiently taken into account by public authorities and industry.

On the whole, making sense of the diverging views and preferences of citizens towards nanotechnologies is a challenge in itself. Despite a very general trend of cautious optimism coupled with concerns over health and safety and quality of life, perceptions towards nanotechnologies vary across nations, age, gender and socio-economic backgrounds. They also fluctuate over time in response to new scientific discoveries, policy developments and media coverage.

¹⁰ Interestingly, NanOpinion project (see footnote 12 below) respondents, while showing broad support for the use of nanotechnologies, also sought reassurance that an “exit strategy” could be implemented in the event that unexpected risks come to light.

¹¹ The DEEPEN project (2006-2009) was a three-year EU-funded project. DEEPEN aimed to establish an integrated understanding of the ethical issues posed by emerging nanotechnologies, develop methodological tools for engaging civil society and the nanoscience community in ethical reflection, and recommendations for incorporating ethical understanding into research practices and governance structures. ¹¹ DEEPEN aimed to integrate understanding of the ethical dilemmas posed by emerging nanotechnologies into the innovation trajectories of the technology itself.

¹² The NanOpinion project was a 30 month project, which began in May 2012, and aimed to investigate how opinion on the generation of nanotechnologies is shaped, and how to inform public debate, particularly among hard to reach groups, and how to enhance education. The project included surveys, social media, discussions, street labs, and events in public and semi-public spaces.

Indeed, NanOpinion found that **the higher the education level, the greater the knowledge of nanotechnologies**. The project also found that **men have heard more about nanotechnologies than women, with a slightly higher willingness to buy nano-products among men**. The different information needs of men and women should be taken into account: men tend to prefer fact-based information about nanotechnology, while women appreciate recommendations relevant to daily life that they can transform into concrete behaviours.

Second, the outcomes of public perceptions research need to be transformed into a form of advice that can be taken up in research and policy decisions. Indeed, it is often difficult to tell what sorts of changes in nanotechnology policies would be needed to align them better with public views and preferences. Public surveys can offer a background view on general public preferences, but they do not automatically offer direct guidance for the direction of research. This suggests the need to ‘translate’ and communicate findings from public perceptions research to policy and research decision making, and to help policy makers to integrate the variety of public preferences in policy decisions.

4. SPECIFIC METHODOLOGIES OF INTEREST FOR GONANO

Here we briefly outline specific methodologies for engagement/co-creation that may be of interest to GoNano. These methodologies will be considered further in the GoNano methodology development work in WP2. The methodology used in the PACITA project –with some tweaking - is of particular relevance to GoNano. We also identify aspects of the CIVISTI and CIMULACT projects that may serve to supplement and strengthen the overall GoNano approach.

The stakeholder-based Technology Assessment process in the **PACITA project**¹³ can serve to inspire the co-creation methodology in GoNano as follows:

- The use of scenario workshops to tease out participants’ concerns and visions of future technology serves – in presenting concrete, predefined scenarios - to stimulate participants’ deliberations regarding how they envision the future. In addition, user stories of people living in the scenarios were developed to make the scenarios more tangible. **While GoNano deals with complex technologies – and technologies and ethical issues which might be new to citizens – scenarios might be a good way to kick - start and qualify the debate. In addition, given that nanotechnology is a broad concept, scenarios might be helpful in narrowing the focus.**
- As scenarios will steer the discussions and outcome considerably, it is important to consider them carefully. In the PACITA project, a group of diverse stakeholder representatives and experts were tasked with developing the scenarios in order to ensure that they reflected different views, possible developments in the technology, etc. The scenarios were developed based on professional stakeholders’ knowledge and perspectives. Hence, the scenarios were realistic and based on professional knowledge

¹³ PACITA¹³ (*Parliaments and civil society in Technology Assessment*) was a four-year (2011-2015) EU project. It was aimed at increasing capacity and enhancing the institutional foundation for knowledge-based policy-making on issues involving science, technology and innovation, mainly based upon the diversity of practices in Parliamentary Technology Assessment (PTA). See Appendix 3 for the project report.

about what is technically feasible, while they reflected different experience-based perspectives on practical, social and economic needs. The workshop also left room for adjustment of the scenarios and for the development of new scenarios. This combination of predefined options and flexibility provided a fruitful starting point for the deliberations without constraining them.

- Task 1.3 of GoNano provides insights into relevant technological fields and potential future developments and issues – this data could serve as important input in the development of scenarios. As regards the representation of different perspectives in the scenarios, T1.2 and T1.3 offer some insights. The citizen workshop could also form the basis for the development of scenarios, which, in turn could serve as a basis for the first stakeholder workshops.

A PACITA-like approach can be supplemented by some of the steps taken in the CIVISTI project¹⁴. The overall aim of **CIVISTI** was to integrate different visions and ideas about the future to empower citizens' perspectives on (political) agenda setting with respect to science funding at the European Commission. For GoNano, the development of the method is of particular interest as GoNano's Pilot Studies borrow partly from this process with regard to citizen – stakeholder – interaction and workshop organisation.

The CIVISTI process includes the following steps:

1. Framing: the aim of the deliberation process was decided upon in the framing stage. Furthermore, information material was developed for the citizen panels and a detailed process for the first citizen consultation (CC) was planned.
2. CC1 – First citizen consultations producing citizens' visions
3. Analysis of the visions and development of an analytical model for expert-stakeholder workshop
4. Expert-stakeholder workshop deriving recommendations from visions: 18 experts and stakeholders worked for two days on deriving recommendations for future S&T from the citizens' visions.
5. CC2 – Second round of citizen consultations evaluating the policy recommendations
6. The results were presented and debated at a policy workshop
7. Support from a web-based content coordination tool developed in the project

The major difference between GoNano and CIVISTI is in the anticipated outcome of step 4 above. CIVISTI stakeholders were tasked with developing recommendations for future science and technology developments. In GoNano, stakeholders are asked to develop concrete product suggestions. Thus, citizens' visions developed in GoNano will have to be made more tangible than in CIVISTI. Concretely, this implies that the GoNano workshops will have to be framed and structured differently.

¹⁴ CIVISTI was an EU project funded under the FP-6 programme of the European Commission (2008-2011). It was coordinated by Teknologiraadet - The Danish Board of Technology (DBT). CIVISTI was an EU-wide collaboration which aimed at evaluating relevant topics and priorities, offering different perspectives on pressing societal issues. Through CIVISTI, a new qualitative foresight-method was developed and tested in seven EU-countries. See Appendix 3 for the full project report.

Finally, the CIMULACT project¹⁵ serves to illustrate the importance of maintaining interconnectedness between the various activities in GoNano. The **CIMULACT project** aims to foster a more open research agenda sensitive to societal visions and values, needs and fears. The project engages European citizens in formulating visions for a desirable and sustainable future. Through a series of processes between citizens and stakeholders, these visions will be transformed into actual research policy topics and recommendations. These topics and recommendations will, in turn, be communicated to key policymakers with the aim of inspiring and shaping national and European research programmes. Exhibitions, catalogue and posters were used to communicate the outcomes of one phase in the next. CIMULACT acts as an example of how to process and use the outcomes of one workshop in the following.

The ‘National Citizen Vision Workshops’ (NCVs) may also be of interest for the citizen engagement in GoNano. NCVs were held in 30 European countries with a uniform format. The first phase of the workshops was the ‘imagination phase’ that consisted of three exercises: In the first exercise, the citizens were guided through different societal challenges from one generation ago until the present day, and were asked to align themselves with the hopes and dreams that citizens had in relation to these challenges. The aim was to enable the citizens to grasp the huge changes a society undergoes over 30 years. In the second exercise, the citizens used situation cards (photographs of everyday life situations) as a tool to imagine situations they felt might change over the next generation. In the third exercise, they used their imagination to envision a potential future. On the basis of this, the citizens identified their hopes and fears for the future, and finally formulated their visions for the future. Aspects of this approach may prove useful for the citizen visioning workshops in GoNano.

5. LESSONS FOR GONANO FROM THE PUBLIC ENGAGEMENT LITERATURE¹⁶

Based on the large body of literature on public engagement, various lessons can be learned for GoNano. In GoNano, the aim is to organise a co-production event with citizens and stakeholders shaping research agendas and potentially policy agendas. The rationale behind these co-creation processes is that civil society should have a say in decision-making processes regarding the further development and embedding of nanotechnology in society (Krabbenborg & Mulder, 2015). In GoNano, the engagement processes are initiated top-down. Irwin (2001) noted that the downside of top-down (invited) public engagement is that it predetermines who is a relevant participant, and also carries implicit assumptions about how citizens should

¹⁵ The CIMULACT Project (Citizen and Multi-Actor Consultation on Horizon 2020), is a three-year project (initiated in June 2015) funded by the European Commission. The project is coordinated by the Danish board of Technology (DBT). The overall aim of CIMULACT is to foster a more open research agenda that is sensitive to the societal need, fears, values and visions. The project will engage European citizens to formulate visions for a desirable and sustainable future, and through several interacting and participatory process between citizens and relevant stakeholders from academia and policy, these visions will be transformed into actual research policy topics and recommendations. These topics and recommendation will be communicated to key policymaker with the aim to inspire and shape national and European research program. See Appendix 3 for the project report.

¹⁶ See Appendix 10 for the full report.

participate. Nevertheless, Delgado et al. (2011) state that, in the case of some (emerging) technologies there is a lack of direct experience of hazards or a lack of awareness, and therefore invited engagement practices are needed. This might be the case with nanotechnology as most research suggest that the public's perceptions of nanotechnology are primarily positive (Dijkstra & Critchley, 2016). Furthermore, top-down initiated public engagement exercises provide the opportunity to influence the design and to strategically choose the publics and stakeholders to engage. Both are important characteristics for successful engagement processes (Reed et al., 2017).

When selecting the publics for the citizen consultation, we should carefully think about how we construct the public. These constructions can differ among application area. In the area of health, relevant publics could be the general public, patients, family of patients, people working at hospitals, while, in the area of food, the general public is also the consumer. In addition, we should consider other criteria that should be taken into account in selecting the audience. For the citizens' consultation workshop, it might be wise to select people from different local communities, with different values, and different socio-economic status. In addition, the knowledge component should be taken into account. Power dynamics might be adversely affected if we invite citizens who have a lot of knowledge about nanotechnology, along with people with very little knowledge. From this point of view, stakeholders should be invited to separate sessions.

The motives and goals for the citizens' consultation and co-creation workshop should be clearly defined and communicated. On the one hand, we are looking for input to research agendas on nanotechnology in three areas, focusing on three innovations per area. On the other hand, we are also looking for a way to engage citizens and stakeholders in science, so we should clearly define our objectives in this regard as well.

When designing the methodology for the citizens' consultation and co-creation workshops, we should ensure that participants feel empowered to engage. As mentioned previously, the role of the moderator, the way in which information is presented and the set-up of the debate are important elements here. Furthermore, especially with regard to the stakeholder workshops, the problem of closure might arise, as some parties may think fundamentally differently about issues. These fundamental differences should be approached in a constructive way, without forcing stakeholders to conform to a compromise they do not agree with. It is necessary to explore whether differences stem from preferences or from values, as values are much harder to change than preferences.

6. NATIONAL DIALOGUE INITIATIVES IN PARTNERS' COUNTRIES:

SOME INSIGHTS

National nanotechnology dialogue initiatives in partners' countries were reviewed and reported upon. While these initiatives do not focus on co-creation as such, they nonetheless address an important element of the co-creation process, i.e. issues that arise in engaging publics in complex issues of science and technology. The following section briefly outlines national dialogue initiatives in the Netherlands, Norway, Denmark, Ireland, Austria and the Czech

Republic; the countries here pursued a myriad engagement and dialogue initiatives with different formats, different target audiences, and varying levels of engagement.¹⁷

First, the formats analyzed varied. A few dialogue initiatives that were analysed were events that lasted for a longer period of time, and included various activities, such as STRIVE in Ireland and the Dutch Societal Dialogue on Nanotechnology. Other events that were analysed were stand-alone activities lasting for a shorter period, such as The Science Theatre in Denmark, and the Seminar ‘The Nanotechnologies are coming’ in Norway. A third category that was included in the analyses was a platform for collecting and disseminating information or for stimulating cooperation between stakeholders, with the aim of encouraging dialogue (e.g. NANOBIOWAT in Czech Republic, NanoinformationsPortal and Nano Information Commission – NIK- in Austria). Across the events, a wide range of different activities were organized, including science cafes, seminars, forums, workshops, expert committees, websites, and exposure in traditional media. The different formats and activities show that ‘dialogue’ is a rather broad and abstract concept and that every country has its own approach to concretising it.

In addition, the target audience that was included differed. Some events targeted the public in general (e.g. Research days in Norway, Science Theatre in Denmark, NanoinformationsPortal in Austria). Other events focused on specific target audiences, mostly a combination of professionals, including researchers, policy-makers, and industry. STRIVE (Ireland) and the Dutch debate on nanotechnology included a variety of target audiences, and also specified different publics, such as children, students and local communities. The different target audiences mentioned in the analysis demonstrate that national dialogue events do not only target the general public, but also include professional actors as a target audience.

With respect to the level of engagement, along with informing and consultation, most events also focused on engaging the target audience (e.g. STRIVE in Ireland, Dutch Dialogue in the Netherlands, a deliberative process arranged in Norway in connection with the NanoDiode-project Science Theater in Denmark, MEDETOX and NanoBiowat in Czech Republic). However, there were very few events that included co-creation elements or referred to it as such. For example, there were some upstream elements included in the Nanodiode project, but these were not labelled as co-creation. The same applies to the Science Theater in Denmark and the dialogue events in Ireland and the Netherlands. These findings are in line with findings from literature, as only a limited number of articles in the public engagement corpus explicitly refer to co-creation. Exceptions include the study of Gudowsky and Peissl (2016) who proposed co-creation as a tool for responsible science, technology and innovation (STI) governance, and Trencher, Yarime, McCormick, Doll, and Kraines (2014) who referred in their study to co-creation as a joint activity of university, government, industry, and civil society in creating social, technical and environmental transformations.

Most of the initiatives were organized by either a research institute or the government, and initiated top-down. Next to technical universities and boards of technologies, other research institutes also participated, such as the School of Communication at Dublin City University, the Center for Art and Science (SDU) in Denmark, and the National Institute for Consumer Research (SIFO) in Norway. Private companies were among the organising actors in the Czech Republic’s

¹⁷ See Appendix 9 for the full reports.

‘Nanobiowat initiative’. This indicates that dialogue events have both a technical and social embedding, but that they are often organized top-down by formal institutions. However, the conclusion of initiatives often organized by (semi-) public institutions is not in line with the findings of Ehrenstein and Laurent (2016). They found that, in many European countries, the boundaries related to public engagement in technology between public and private initiatives are diffuse; for example, in the UK, upstream engagement took shape within a collection of think tanks and consulting firms. An exception among European countries is France. The French government initially organized most public engagement initiatives, but an active opposition against nanotechnology emerged bottom-up. Activists gathered within a group called PMO (Pieces et Main d’Oeuvre) and campaigned against nanotechnology and interrupted several public engagement events (Ehrenstein & Laurent, 2016).

6.1 LESSONS FOR GoNANO

Based on the outcomes and evaluation of the initiatives, some lessons can be learned for GoNano. The outcomes differed per event. Some events led to input for policy making (e.g. NanoDiode in Norway, MEDETOX in Czech Republic), while others led to a more informed general public (e.g. Science Theater in Denmark, STRIVE in Ireland, Dutch debate on Nanotechnology). However, very few events were evaluated as leading to measured outcomes, and most outcomes remained in abstract formulations (i.e. ‘more informed’, ‘input for policymaking’). When organizing GoNano it would be good to think of specific objectives to be obtained, and to measure the impact of the events in relation to these objectives. These objectives can go beyond an assessment of risks and opportunities of nanotechnologies and nanoproductions. Evaluation should also focus on how processes of co-creation can increase trust in science, and changes in the institutional culture of science and policy. According to Wynne (2006) the latter is desperately needed, as public engagement processes have too often been used as an ‘institutional alibi’, without restoring public trust in science as an institution.

Furthermore, based on the evaluation of the events, several recommendations for GoNano can be made. First, as nanotechnology is a broad and abstract concept, it is important to select specific applications and products. This contributes to opening up the dialogue and debate. Second, it is important for GoNano to include a diverse group of stakeholders, going beyond traditional networks. This should be next to the usual ‘public suspects’, including private companies, CSOs, and a variety of potential consumers. Additionally, next to the diverse stakeholders, a broad range of the general public should be also included to be as inclusive as possible. Third, it is important to seek continuous dialogue and engagement with the public. The dialogue should not conclude after the citizen consultation, but should continue. A website offers a good platform for this. Fourth, the use of creative formats in the workshops, for example, art, can open up different dimensions in the debate which can lead to new perspectives.

7. IN CONCLUSION

The GoNano project will implement creative and informed co-creation exercises in the objective to co-create future nanotechnologies with citizens and professional stakeholders. This deliverable has outlined the multitude of requirements necessary for a productive and effective

co-creation exercise, at both substantive and procedural levels. Moreover, the deliverable highlights the various perspectives and lenses through which both professional stakeholders and citizens view nanotechnologies and their potential embedding in society. Mutual learning for co-creation requires that such various assumptions and understandings of nanotechnology are opened up by the facilitators of the co-creation exercises. Insights regarding public perceptions of nanotechnology highlight the need for information to be tailored and made relevant to the specific needs and contexts of the citizens engaged in GoNano. In terms of specific methodologies for GoNano, inspiration can be taken from other stakeholder-based projects, with some tweaking to both conceptualisation and practical implementation. Insights from the public engagement literature emphasise - amongst others - the need to think carefully about how to construct the public, especially given GoNano's three application areas. GoNano can also learn from previous dialogue initiatives. One particularly important lesson foregrounds the importance of measuring the impact of the GoNano co-creation exercises in relation to specific objectives. GoNano should also examine and evaluate how processes of co-creation can serve to enhance trust in science, in addition to the forms of advice that can be taken up in research and policy.

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APPENDIX 1 PROJECTS SURVEYED

Projects and initiatives surveyed:

PROSO, NERRI, SYNENERGENE, NANO-BIORAISE, CIVISTI, ENGAGE 2020, FOTTRIS, NANOROADMAP, NANODIODE, Human Brain Project, DEEPEN, CIMULACT, Genetics Clinic of the Future, Nano2All, CALIBRATE, COMPASS, PACITA, SATORI, NanoNext NL Risk Analysis and Technology Assessment (RATA) programme, NUCLEUS, NANNOPLAT, NANOCAP

Projects and initiatives addressed in interviews:

EDF-DuPont collaboration, BASF Creator Space, CarbonKiller, NanoTalk, NanoDialog, COMPASS, Making Sense EU, Vision Lines 20, PERARES, Science2Society, NanOpinion

Partial or irrelevant reports:

RRI-TOOLS, MARINA, ATBEST, NanoBioWat, Medetox, NanOpinion, OBSERVATORY NANO, ASSET

APPENDIX 2: PROJECT REPORT TEMPLATE

TEMPLATE FOR GONANO TASK 1.1 BUILDING ON THE STATE-OF-THE-ART; EX-POST EVALUATION ON MUTUAL LEARNING

DATE: 22.11.2017

Partners are asked to please be as specific as possible with respect to the various headings below. Total length 2- 2,5 pages.

Description of the project (not more than 1 paragraph)

Which activity in this project was most relevant for GoNano? Could you describe why?
Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Which kinds of stakeholders were involved? At what stage were they involved?

How were the co-creation activities/engagement activities/mutual learning events organised?

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

How to organise productive co-creation meetings?

The procedural requirements for successful stakeholder involvement?

Inspiring outcomes?

Good practices?

Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

APPENDIX 3: PROJECT REPORTS

In the following, the reviews of earlier mostly EU-funded projects are collected. Different members of the GoNano-consortium have written the reviews.

THE HUMAN BRAIN PROJECT

Description of the project

The Human Brain Project is a H2020 FET Flagship Project which strives to accelerate the fields of neuroscience, computing and brain-related medicine.

Ethics and Society is part of the Human Brain Project's research core. Ethics and Society carries out research to identify and address the conceptual, social, ethical, legal and cultural implications and challenges raised by HBP research. We focus on foresight, neuroethics, philosophy, public engagement, and researcher awareness. Ethics and Society also translates ethics research into practice by implementing ethics management and compliance programmes for the HBP, and collaborates with an independent Ethics Advisory Board (EAB), as well as produces Opinions on the most immediately relevant ethical issues within the HBP

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The Ethics and Society work on Foresight, stakeholder and public engagement (T12.1 and T12.3). The work is an example of developing an approach to RRI in a large research project.

The Foresight task uses scenarios, workshops and SF to draw out issues of ethical and societal relevance, and to stimulate reflection and learning.

The engagement task works to involve stakeholder and publics in making recommendations to actual HBP work. For stakeholder engagement, mutual learning is the goal of expert workshops, where participants with a broad range of disciplinary backgrounds meet to reflect on central issue of interest and importance for all groups. Examples from the HBP include “privacy and data protection in research project”, “dual use issues in neuroscience, supercomputing and robotics”, “The contribution of theory and data for ICT models”.

In the public engagement task EU publics are consulted on their recommendations for focused areas of social and ethical relevance. The recommendations are brought back into the project, but there is no explicit mechanism or objective for mutual learning.

Which kinds of stakeholders were involved? At what stage were they involved?

For the Foresight and stakeholder engagement activities stakeholders are mainly other researchers, which are not part of the HBP. This could e.g. be legal scholars, social scientists, philosophers, IT model builders (e.g. open source coders), neuroscientists (broadly, also philosophers working on theory of mind and consciousness, industry, public health authorities), policy-makers.

Stakeholders are involved continuously as the research is defined, and carried out. The HBP is a 10-year project, and it is being adapted to findings both in terms of the science, but also in terms of governance and management structure fitting a large project.

How were the co-creation activities/engagement activities/mutual learning events organised?

Events are organised by partners in the ethics and society group. Stakeholder and foresight events are organised as workshops. Format differ slightly, but evolve generally on expert presentations with discussion and opportunities for group work. Experts may be utilised as co-organisers and co-facilitators of the events.

Public engagement events have been organised as half and full day events. The half day format combined questionnaires with group interviews. The full day format combined an online survey with face-2-face events, where workshops combined video introductions with group work. Manuals for the public engagement events are uploaded to the Google Drive.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

How to organise productive co-creation meetings?

- Keep presentations short
- Make sure you have interesting people there, that participants want to meet
- For stakeholder engagement, enrol one or more persons known to other participants as co-facilitator/organiser
- For public engagement, find a meeting location that is interesting to go to, and add e.g. a free museum tour, lunch to make the travel and effort worthwhile
- Make sure you keep focus on the aim of learning. Continuously probe your participants on their experience of learning
- Make sure any assignments are clearly formulated and doable
- Make sure the purpose of the event is clearly defined and easily understandable

The procedural requirements for successful stakeholder involvement?

Good preparation and follow-up is essential.

Inspiring outcomes?

Newsletters from engagement events .

Good practices?

The stakeholder and public engagement activities are examples of good practices.

Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

- An interest
- Clear relevance
- Well formulated objectives and aims
- Clear added value for participants

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

You will need explicit attention to the objective 'mutual learning', and need to design the methodology specifically with that aim in mind. Participants should be probed before and after an even on perceptions of learning, and the goal made explicit invitations and introduction to the event.

SATORI

Description of the project

SATORI (Stakeholders Acting Together On the ethical impact assessment of Research and Innovation), has developed an EU framework for ethics assessment of research and innovation. To reach European consensus the research findings were further developed into the SATORI CEN Workshop Agreement (CWA 17145-1 and CWA 17145-2). The project engaged private and public stakeholders from Europe and beyond in an intensive process of research and dialogue. These included: ethicists from medicine, law, business, humanities, members of ethics committees, policymakers, science academies, professional organisations, research funders, industry, the media and civil society organisations. The project explored various dimensions of ethics assessment including: human subject research, dual-use, institutional integrity, research integrity, animal welfare etc. The project's framework is a tool to strengthen ethics assessment overall, and facilitate responsible research and innovation (RRI).

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The SATORI project did extensive analytical work on the landscape of MML projects, as well as wrote an extensive report on theories of learning to develop criteria for evaluating mutual learning.

The aim of the report on the MML landscape was to develop guidelines for participatory approaches by analysing available methods, as well as existing applications of participatory processes in MML projects. The report is relevant for GoNano as it could guide us in developing our approach to co-creation by providing insights into the variety of participatory approaches, as well as insight into practical experiences with application in other projects.

The report on theories of learning and criteria for evaluating mutual learning is particularly relevant for task 1.1 in developing its approach to evaluating mutual learning of other public engagement projects in nanotechnologies, and emerging technologies more broadly.

Which kinds of stakeholders were involved? At what stage were they involved?

The project involved a broad range of stakeholder in ethics assessment. In its first phase the project did extensive analytical work interviewing stakeholders spanning ethicists from medicine, law, business, humanities, members of ethics committees, policymakers, science academies, professional organisations, research funders, industry, the media and civil society organisations to learn about their approach or perspective on ethics assessment and guidance.

The project then developed a draft framework for a European approach to ethics assessment and guidance, which it discussed with stakeholders in a number of workshops. The workshops were:

- A main workshop to engage stakeholders in the design of the SATORI framework
- Training sessions to introduce the SATORI framework in selected Member States
- A testing workshop regarding the cost-effectiveness ethical assessment
- Stakeholder discussions about the impacts of ethical assessment
- Strategic planning with key stakeholders to ensure sustainability of the framework.

From the SATORI evaluation reports we learn about success criteria for participatory workshop and the facilitation of mutual learning that it is important that:

- Aims of the workshops are clear
- Language of texts should be clear, and definitions concise and consistently used
- Any preparatory documents should be circulated well in advance
- Participants to workshops should be invited well in advance
- Good planning is essential, organisers should analyse if they have sufficient budget as well for the workshop they envision
- Good rooms, fit for purpose are very important
- Groups should be well mixed
- Participants appreciate time to discuss, to share information, network, to work on task and cases (if well-defined and doable), a nice and friendly atmosphere, and good time management
- Long introduction presentations should be avoided
- Communication should be based on issues relevant to invited stakeholders and EU lingo should be avoided

The project continuously aimed at involving the broad range of stakeholders mentioned above in all its workshops.

Please note, the project did not engage with the general public.

How were the co-creation activities/engagement activities/mutual learning events organised?

All events were organised as workshops. Mutual learning workshops were mainly organised to work on case studies to support reflection, or to work with/try out tools for ethics assessment developed by the project. As mentioned in the above section, spending a lot of time on one-way presentation should be avoided. The SATORI project had a tendency to start its workshops with long presentations, and these were not well appreciated by participants. Participants cannot oversee a large complex project, and often have little interest in knowing what WP and task they are involved with contributing too. Instead communication with participants should focus on content, and issues that are relevant and interesting to them (avoid the communication trap “sender bias”).

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

How to organise productive co-creation meetings?

Yes, please see the list of criteria above. Deliverable 5.3 also contains the outline of a program for co-productive workshop

The procedural requirements for successful stakeholder involvement? Yes, please see the list above. In addition these requirements should be complimented with the guidelines from D2.1 the Handbook on participatory processes. Guidelines include:

- Setting the objective by asking:
- What is the purpose of the event?
- Have you clear and measurable objectives?
- Have you agreed these objectives with partners and or funders?

- Have you identified desirable outcomes and established how you will measure these?

Defining the topics by considering:

- Knowledge: to what extent do various publics possess general knowledge of the subject/topic?
- Maturity: to what extent have various publics already developed opinions or even legislation on the subject?
- Complexity: is the subject highly complex, such that a great deal of (technical) information is required?
- Controversy: is the issue highly controversial and has the debate become polarised to the extent that consensus is difficult to reach?

Defining participants:

- Who will be affected by the issue?
- Who may be potentially affected in the future?
- Who can contribute to a solution that will meet the needs of the widest range of stakeholders and publics?
- Who will insist on being involved and cannot be excluded?
- Should politicians be involved?
- Which segments of the public should be involved: individuals, consumers, specific demographic groups such as youth or older adults, marginalised, hard-to-reach populations, industry associations and individual industries, scientific, professional, educational or voluntary associations, local communities, etc.?

Defining level of participation, which for GoNano fall somewhere in between level 4 and 5 (repeated below) of Arnstein's ladder descriptions given by SATORI D2.1

4) It is necessary to have citizens talk to each other regarding complex, value-laden issues; there is a capacity for citizens to shape policies and decisions that affect them; there is opportunity for shared agenda setting and open time frames for deliberation on issues; options generated together will be respected.

5) Organisers/institutions want to empower citizens and groups to manage the process; citizens and groups have accepted the challenge of developing solutions themselves; institutions are ready to assume the role of enabler; an agreement has been made to implement citizens and groups.

Defining outcomes:

What are key outcomes, primary, secondary etc.

Keeping in mind the context of a participatory exercise, what is the framework used, how does it influence what contributions can be made, political, cultural context, and power differences between participants? D2.1 p. 18-19

In summing up, the SATORI project develops a number of key insights on mutual learning from previous MML projects, and develops a list of "good advice" to SATORI partners, which are also prudent advice for GoNano partners. The D2.1 also includes a very good schematic overview and analysis of previous MML project from p. 28-48. Key insights include:

Collected Advice:

It is crucial to have a clear idea as to why stakeholders should be involved. In this regard, the following issues should be considered: why should someone - a stakeholder - join a project, what is their role in it, what kind of collaboration can they offer, etc.?

It is important to think about how to motivate people to participate: some participants are limited by resources (time and financial), while others do not feel that ethical issues/problems are relevant to their practice.

A number of interviewees identified media representatives as key stakeholders but did not know how to involve them. Furthermore, media representatives are viewed as a category with its own agenda that is not always as clear as that of science or industry representatives. One of the interviewees stated that this is because media representatives have never been considered as independent stakeholders but only as a “passive node” along the transmission chain of knowledge.

There are different aspects to mutual learning and it is important to understand the different elements involved.

The SATORI project lists a number of methods, which can be used for participatory exercises (D2.1). Inserted below as a picture from the pdf.

Inspiring outcomes?

Good practices?

I think the main learning for GoNano lays in the analytical work done by SATORI, as well as the evaluation results of its stakeholder engagement workshops.

Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

- In order to be able to assert something about the degree of learning that has taken place, one needs to know what the baseline is. Follow up as to the degree of learning that occurred, in addition to the point at which learning occurred, is important.
- One important outcome of learning is a consistent change in behaviour. This is difficult to measure, however, given that projects run for a specific duration of time. Another learning outcome is a process of reflection in which reflective thinking is integrated into daily activities.
- The notion of mutual learning – with an emphasis on “mutual” – does imply a degree of consensus amongst all participants.
- Mutual learning involves a genuine exchange between stakeholders and scientists and the creation of new knowledge.
- The interests and motivations of targeted stakeholders should be carefully examined in order to solicit and retain their active involvement.
- Expectation management with respect to the aim and desired outcome of the co-creation/engagement process is key. The roles of stakeholders and the research topic should be clear.

- The impact of participation is very important; participants should be familiar with the anticipated impact and receive follow-up communication regarding the outcomes of their participation.
- Tracking and measuring of the mutual learning achieved in co-creation activities is important, for both the legitimacy of the process and for the overall success of the initiative.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration. Insights on mutual learning and good participatory processes:

I would follow the recommendations given above by the project on process, as well as considerations on how to evaluate and guide mutual learning by making it an explicit aim of any co-creative activity.

CIMULACT

Description of the project

The CIMULACT Project (Citizen and Multi-Actor Consultation on Horizon 2020), is a three-year project (initiated in June 2015) funded by the European Commission. The project is coordinated by the Danish board of Technology (DBT). The overall aim of CIMULACT is to foster a more open research agenda that is sensitive to the societal need, fears, values and visions. The project will engage European citizens to formulate visions for a desirable and sustainable future, and through several interacting and participatory process between citizens and relevant stakeholders from academia and policy, these visions will be transformed into actual research policy topics and recommendations. These topics and recommendation will be communicated to key policymaker with the aim to inspire and shape national and European research program.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The 'National Citizen Vision Workshops' (NCVs) is in particular interesting regarding the citizen engagement in GoNano. NCVs were held in 30 European countries with a uniform format. The first phase of the workshops was the 'imagination phase' that consisted of three exercises: In the first exercise, the citizens was guided through different societal challenges from one generation ago up till today, and try to identify themselves with the hopes and dreams that the citizens had in relation to these challenges. The aim was to enable the citizens to grasp the huge changes a society undergoes during 30 years. In the second exercise, the citizens used situation cards (photographs of everyday life situations) as a tool to imagine situations they thought might change over the next generation. In the third exercise, they used their imagination to envision a potential future. On the basis of this, the citizens identified their hopes and fears for the future, and finally they formulated their visions for the future. The outcome of the NCVs was 179 concrete visions for a sustainable future¹⁸.

Which kinds of stakeholders were involved? At what stage were they involved?

The NCVs involved a diverse selection (regarding sex, education, residence and education) of lay people from all 30 involved European countries. The following participatory processes engaged more than 3000 European citizens, experts within social needs, consortium partners and policymakers related to RRI in validating and enriching the citizens' visions. In the final participatory activity (The 'Pan-European Conference'), Commission Project Officers, experts and consortium partners was involved in the process of transforming the visions into the final research recommendations and topics.

How were the co-creation activities/engagement activities/mutual learning events organised?

All the activities in CIMULACT were closely interconnected and organised so that they built upon each other. In this way, the outcome of each activity was directly used in the following, and the citizens' visions developed in the first phase lay the foundation for all of the following phases.

The CIMULACT organized four phases of engagement activities in the following order.

¹⁸ <http://www.cimulact.eu/wp-content/uploads/2016/06/D1.3final.pdf>

The NCVs (described above).

The ‘Scenarios Co-creation Workshop’ was a 2-day workshop that engaged researchers, experts and one citizen from each of the 30 involved European countries. The workshop was kicked off with an exhibition of 29 social need extracted from the citizens’ visions¹⁹. Hereafter, the participants was divided in diverse teams consisting of consortium partners, researchers and citizens. By using design thinking methods and scenario building, the teams formulated 48 possible research program scenarios²⁰.

The third phase was the second consultation phase consisting of an online consultation and National Research and Policy Workshops (NRPs) in all of the 30 involved European countries. The aim of the second consultation phase was to validate and enrich the 48 research program scenarios.

Finally, the ‘Pan-European Conference’ (PEC) was held. Here, policymakers, experts and consortium partners reviewed the validated the research program scenarios. The outcome of the conference was 23 elaborated citizen-based research topics and recommendations that were disseminated to relevant stakeholders within research policy both on national and EU level²¹.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

In general, CIMULACT is an exemplary project regarding to the interconnectedness between the different activities in the project. E.g. exhibitions, catalogue and posters were used to communicate the outcomes of one phase to the next. Regarding GoNano, it shows how to process and use the outcomes of one workshop in the following. In addition, the methodology used in the NCVs could be used as inspiration for methodology development in ‘the deliberation and envisioning workshop with citizen’ in GoNano.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Based on the analysis, it is recommended to use the outcomes from the ‘deliberation and envisioning workshops with citizens’ in GoNano to frame the following ‘co-creation workshops with stakeholder’. The outcome can e.g. be communicated through exhibitions, catalogues or poster as in the CIMULACT project. In addition, it could be considered to draw on the used

¹⁹ http://www.cimulact.eu/wp-content/uploads/2016/04/Cimulact_ALL_POSTER_SOCIAL_NEEDS_reduced.pdf

²⁰ http://www.cimulact.eu/wp-content/uploads/2017/03/CIMULACT-D2.1_final.pdf

²¹ http://www.cimulact.eu/wp-content/uploads/2017/03/CIMULACT-Deliverable-2.2-2017_low_res.pdf

methods in the NCVs (described above), when organizing' the deliberation and envisioning workshop with citizens' in GoNano.

NANO2ALL

Description of the project

The NANO2ALL (Nanotechnology Mutual Learning Action Plan for Transparent and Responsible Understanding of Science and Technology) is an ongoing project (Oct. 2015- Apr. 2019) funded by the European Union Horizon2020 program. With a participatory approach based on dialogue with citizens and relevant stakeholders, the project aim to enhance RRI practices in nanotechnology. Based on a review of previous dialogue projects related to nanotechnology, the project firstly identified best practices, tools and guidelines. On the basis of this, three phases of dialogue sessions in six European countries was held. The first phase involved citizens, the second involved national stakeholders and the last session involved stakeholders on EU-level. The outcome of the project was a roadmap on how to ensure sustainable and societal engaging future development for nanotechnology.

Which activity in this project was most relevant for GoNano? Could you describe why?

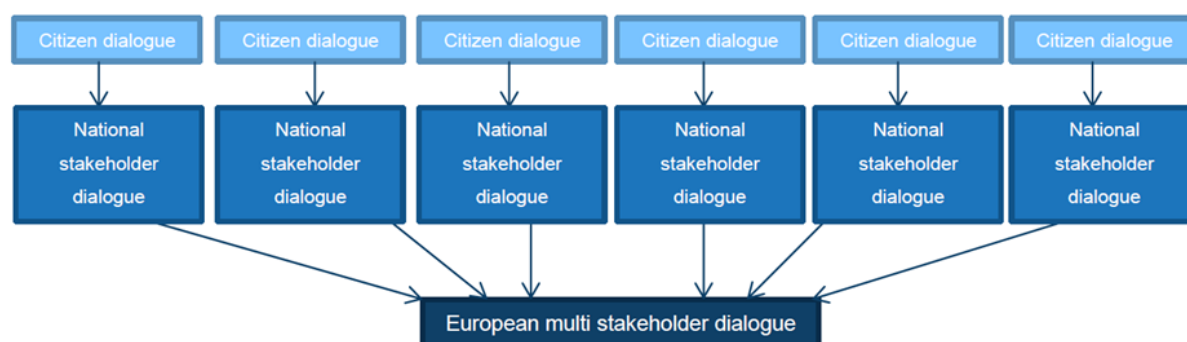
Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

NANO2ALL self-assessment training tool: In advance of the dialogues, a survey was made among the participant to identify the existing knowledge gaps. On the basis of this, targeted training about nanotechnology and RRI and tool for facilitating dialogues and building scenarios was developed and disseminated to the participants. Regarding GoNano, it may be recommendable to use a similar method to identify and reduce gabs of knowledge among the participants in advance of the GoNano workshops.

The NANO2ALL roadmap: The objective of the NANO2ALL is to enable implementation of the NANO2ALL outcomes in European nanotechnology policy. The roadmap is intended to policymakers and researchers and will contain an action plan for enhancement of RRI in nanotechnology. Regarding GoNano, the roadmaps exemplify how to enable implementation of the outcomes of participatory activities. (The roadmap has not yet been developed).

Which kinds of stakeholders were involved? At what stage were they involved?

The first phase of dialogue sessions involved citizens from 6 different EU countries. The second phase involved National stakeholders (actors from policy, media, industry, media, representatives from civil society and others). The final European National dialogue will involve both national and European stakeholder (National and European policy-makers, EU-level CSOs, EU-level industry and research platforms).



How were the co-creation activities/engagement activities/mutual learning events organised?

Each of the phases of dialogue session described above will build upon the previous as described in the following:

During the citizen dialogues the participant explored and constructed possible scenarios of the future development of nanotechnology. On the basis of this, the participants identified common concerns, value and needs regarding the future development of nanotechnology. In the first half of the national stakeholder workshops participant acted through future scenarios based on the output from the citizen dialogues, and in the second half, participatory backcasting was used to explore desirable development of nanotechnology. The European multi-stakeholder dialogues will build on the outcomes and lessons learned from the previous dialogues. Unfortunately, as this dialogue has not been held yet, the methodology is not fully developed. However, the participatory methods will be similar to methods used in the national stakeholder dialogue, but directed to European policy-makers.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Hence the project is still ongoing; no evaluation has been made. Nevertheless, several aspects in the project may be used as inspiration for GoNano.

Firstly, the self-assessment tool help reducing knowledge gabs between the participants in advance of the dialogues. Therefore, it might be useful to develop a similar tool in GoNano to ensure equal level of knowledge. The use of materials in the citizen dialogue might also be relevant for the GoNano workshop: In the citizen dialogue the citizens used craft materials to build objects that symbolized their need, concern and value regarding nanotechnology and created narratives about the object. Regarding GoNano, this exercise exemplifies how materials can be in a more symbolic and abstract way than to build prototypes.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

First of all, it is recommendable to identify knowledge gabs among the GoNano workshop participants, and provide targeted training in advance of the workshops. Regarding to the actual workshops, it is advisable to engage participants in scenario building, as this will ensure active learning and make sure that the scenarios match their actual need, concerns and values regarding nanotechnology. In addition, it might be a good idea to provide materials that the participants can use to express their need and concerns through. Finally, it is recommendable to develop a concrete action plan for how to implement the outcomes of the GoNano in national and EU governance of nanotechnology.

PACITA

Description of the project



PACITA22 (Parliaments and civil society in Technology Assessment) was a four-year (2011-2015) EU project. It was aimed at increasing the capacity and enhancing the institutional foundation for knowledge-based policy-making on issues involving science, technology and innovation, mainly based upon the diversity of practices in Parliamentary Technology Assessment (PTA). The project had 15 European partners²³ from national/regional parliamentary offices for science and technology, science academies, research institutions, universities and civil society organizations. The project was coordinated by the Danish Board of Technology.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The PACITA project involved three cases of Technology Assessment at a national and EU level to build capacity, experience and awareness about the potential of knowledge-based policy making facilitated by Technology Assessment among policy makers and professional practitioners, to mobilise actors and to give input to policy making in the three specific fields. The three cases, which all involve elements of relevance for GoNano, included:

European Future Panel on Public Health Genomics. This example was based on expert-based Technology Assessment involving parliamentarians.

EU stakeholder involvement on telecare technology and home-based telemedicine for ageing societies. This example was based on a stakeholder-based Technology Assessment method aimed at developing broad ownership across stakeholder groups to actions and policy options.

Citizen consultations on Sustainable Consumption. This example was based on a public consultation Technology Assessment method aimed at developing informed ideas and opinions from citizens. The consultation was organized as a moderated debate on the sustainable consumptions and issues related to waste and consumption.

As the GoNano project is about co-creation involving citizens, professional stakeholders and policy makers, there are elements of relevance in all three examples in the PACITA project. However, as co-creation is at the core of the GoNano project, and as the consortium has shown particular interest in working with future scenarios, the telecare technology example is particularly interesting as this involved stakeholders working together to develop concrete future scenarios.

Apart from the three cases, the project also resembles the GoNano project by involving Technology Assessment training and capacity building activities, among other things in the shape of summer schools, workshops and online training material. The project concluded with a Technology Assessment conference.

²² <http://www.pacitaproject.eu/>

²³ The Danish Board of Technology Foundation (DBT), Karlsruhe Institute of Technology (KIT), The Rathenau Institute (KNAW-RI), The Norwegian Board of Technology (NBT), The Institute of Technology Assessment (ITA), The Applied Research and Communications Fund (ARC), The Institute of Technology of Biology and Chemistry (ITQB), The Institute Society and Technology (IST), The Catalan Foundation for Research and Innovation, The Swiss Centre for Technology Assessment (TA-SWISS), Knowledge Economy Forum (KEF), Technology Centre ASCR, University of Liège SPIRAL Research Centre, University College Cork, The Hungarian Academy of Sciences (HAS)

In the following, focus will be on the EU stakeholder-based Technology Assessment of telecare technology and home-based telemedicine for ageing societies.

Which kinds of stakeholders were involved? At what stage were they involved?

In the stakeholder-based Technology Assessment focusing on telecare technology, stakeholders were involved at two stages which are described below. A stakeholder group in charge of providing their knowledge and perspectives on telecare technology for elders in the preparatory process before the main engagement activity, the scenario workshops, involved members from research, industry, elderly care and CSO's. The scenario workshops involved healthcare personnel, patients/users and carers, technology developers and researchers and decision makers from the local and national levels in 9 European countries: Belgium, Bulgaria, Czech Republic, Denmark, Hungary, Norway, Republic of Ireland, Spain and Switzerland. Finally, experts, stakeholders and policy makers were all invited to a concluding conference in Brussels.

How were the co-creation activities/engagement activities/mutual learning events organised?

The example which focused on *telecare technology* with professional stakeholders involved the following steps:

Stakeholder Group: A Stakeholder Group was established with members from research, industry, elderly care and CSO's.

Technology overview and scenarios: A work group of project managers developed an overview of available care technology and home-based telemedicine and expected developments. Based on this, a set of scenarios for implementation and use of technologies in an ageing society was developed. The scenarios used narratives with exemplifying fictional characters to enable reflection on ethical dilemmas and different barriers for implementation of care technology. At a workshop the Stakeholder Group commented on the overview and scenarios, their views on the future development and their preferred policies. The technology overview and scenarios were then adjusted and translated to national languages.

Scenario workshops: Scenario workshops were then organised in 6 European locations. At each workshop 40-50 stakeholders participated involving: Healthcare personnel, patient- and citizens organizations, technology developers and researchers and decision makers from the local and national levels. Each workshop entailed the following sections:

Presentation of technologies and the scenarios

Deliberation on the scenarios:

- Are they realistic? Possible? Desirable? Why/why not?
- Strengths, weaknesses, possibilities and threats regarding how technology is used in the scenario.
- 5 positive and 5 negative responses to each scenario
- Formulation of the participants' own visions and, to establish common ground, prioritising between these. How should the care services be in the future? What dilemmas/choices will be central in order to reach your vision? What can decision-makers do today to stimulate a development that will lead to your vision? Why is this vision desirable?
- Identification of success criteria and barriers for realisation of the wanted development

- Identification of actions and policies that could favour the realisation of the vision
- The outcome of each workshop was visions on the use of telecare in the ageing society with a corresponding set of policies dealing with the expected barriers.

Policy reporting: The outcomes of the workshops were compared in a report as input to national and European policy making and presented to parliamentary committees in the 6 countries/regions and at a Policy Conference in Brussels for experts, stakeholders and policy makers.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

It has not been possible to find any evaluations of the methodology used in PACITA, so the following evaluation is entirely reflecting on the described methods and on the resulting policy reports.

The stakeholder-based Technology Assessment is relevant inspiration for the co-creation methodology in GoNano in different ways:

The use of scenario workshops to tease out participants' concerns and visions on future technology serves, by presenting concrete, predefined scenarios, to stimulate the participants' deliberation about how they envision the future. In addition, user stories of people living in the scenarios was developed to make the scenarios more tangible. While GoNano treats complex technologies – and technologies and ethical issues which might be new to citizens – scenarios might be a good way to kickstart and qualify the debate. Also, nanotechnology is a broad concept, and scenarios might be helpful in narrowing the focus.

As the scenarios will be steering the discussions and outcome considerably, it is important to consider them carefully. In the PACITA project, a group of diverse stakeholder representatives and experts were tasked with developing the scenarios in order to ensure that they reflected different views, possible developments in the technology etc. – see 1) and 2) above under 'How were the co-creation activities organised'. The scenarios were developed based on professional stakeholders' knowledge and perspectives. Hence, the scenarios were realistic and based on professional knowledge about what is technically feasible, just as they reflected different experience-based perspectives on practical, social and economic needs. Still, the workshop left room for adjustments of the scenarios and for the development of new scenarios. This combination of predefined options and flexibility provided a fruitful starting point for the deliberations without constraining them.

Besides, a useful insight is to engage a diverse range of stakeholders. When recruiting stakeholders it is recommended to contact local actors, as they have a network of relevant stakeholders. This will help in the process of mapping all relevant stakeholder groups.

Regarding national differences, there is much to be gained from looking into relevant national statistics, demographics and policy when preparing the national workshops – as is happening in the GoNano project.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Scenarios could in different forms be used for the citizen workshops and/or the professional stakeholder workshops. As mentioned above, the scenarios will be steering the discussions and outcome considerably – hence, they need careful consideration. As mentioned, the scenarios in PACITA were developed on the basis of input from a group of stakeholders and experts. This served to ensure that the scenarios were realistic, addressed the main issues in the field and incorporated a wide array of different stakeholder perspectives. In GoNano, task 1.3 will be providing insights into the relevant technological fields and potential future developments and issues – this could serve as important information in developing scenarios. When it comes to representing different perspectives in the scenarios, T1.2 and T1.3 will be providing some insights. The citizen workshop could also form the basis for the development of scenarios which again could serve as a basis for the first stakeholder workshops. Some work remains, though, in adapting the concept used in PACITA, where the outcome was policy recommendations, to GoNano, where the main outcome is concrete product suggestions.

NANONextNL - RATA PROGRAMME.

Description of the project

The NanoNextNL Risk Analysis and Technology Assessment (RATA) Programme aimed to address broader social and environmental considerations as part of the research done in NanoNextNL, a large Dutch nanotechnologies research and innovation programme. Rather than running ethical, legal and social research activities in parallel with the technological research, the RATA programme sought to integrate risk research and technology assessment with the nanotech research. It aimed to 'practice Responsible Innovation in NanoNextNL' (see Walhout & Konrad: <https://www.utwente.nl/en/bms/steps/staff/practicing-ri.pdf>). It consisted of both a research programme (combining Risk Analysis (RA) and Technology Assessment (TA) parts) and more 'integrated' professional training activities.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The NanoNextNL Risk Analysis and Technology Assessment Courses and Coaching Programme. The courses and coaching programme sought to bring broader risk and social considerations to bear on NanoNextNL research by in-depth, interdisciplinary explorations into the nanotech research and their broader implications.

The courses aimed to introduce nanotech researchers in the NanoNextNL programme to the art of risk analysis and technology assessment, applying RATA to their own research. By way of focused lectures and group work, the courses explored ways to assess environmental and health risks and address public communication, entrepreneurship, and ethics. The courses were very positively evaluated, but because they were only two days, it proved difficult for the PhD students to integrate the insights achieved during the course in their daily work. This is why the coaching programme was developed: it provided support to the students over longer timeframes, so RATA elements could be practically integrated in the students' PhD thesis. This has resulted in a number of 'PhD+'-theses, including RATA-reflections about the research.

Which kinds of stakeholders were involved? At what stage were they involved?

The courses were primarily intended for nanotech researchers (mostly PhD students within the NanoNextNL programme). They engaged with risk researchers from the RA field and SSH scholars from the TA-field) throughout the course.

How were the co-creation activities/engagement activities/mutual learning events organised?

The course programme was largely devoted to enabling mutual learning between nanotech researchers and RATA-researchers: rather than providing lengthy introductions to RA and TA, the courses simply invited the PhD students' to start explaining to the (senior) RA and TA researchers what their own research was about. As the discussions advanced, question of risks and broader societal impact would naturally emanate from the work, ranging from very practical risk questions ("if you want to use this protein scaffold to structure novel foods, what would be the regulatory pathways to get approval?") and considerations about commercialisation ("if you want to use this novel atomic deposition technology for silicon wafers, would the technique be compatible to what companies are currently using?") to broader

normative considerations (“if patients start using your handheld diagnostic device on a large scale, then what could this imply for doctor-patient relationships?”).

This approach would *demonstrate* to the NanoNextNL students that their work did in fact contain all sorts of relevant ethical and societal dimensions (rather than being told it did). It also pointed out to the nanotech PhD students that incorporating broader risk and social considerations was useful and necessary, if they wanted their research findings to be taken up beyond lab experiments and scientific publications.

At the same time, it gave the RATA researchers a much better sense of where exactly their own expertise could be meaningfully applied to specific NanoNextNL research activities.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

1) There is (still) a lot of resistance within the research community against reflection on broader considerations; researchers feel ‘beleaguered’, having to waste time on vague discussions that aren’t going anywhere (time that could have been spent doing research). If we want to engage researchers, it’s up to us to demonstrate that it *does* make sense to look at the broader dimensions: that can be done by pointing out that such reflection can help them achieve *their own* goals (first-order learning, see: https://www.researchgate.net/publication/51774227_What_happens_in_the_Lab_Applying_Midstream_Modulation_to_Enhance_Critical_Reflection_in_the_Laboratory)

This is done mostly by pointing out the value of broader (RATA-)reflection at the micro-level of research decisions, although of course other criteria are at play as well (institutional backing, regulatory support, ‘champions’, etc.).

[Based on our experience in NanoNextNL, I’ve created a list of opportunities and barriers for encouraging broader reflection among researchers that I could share if you think it’s useful].

2) The practical relevance of broader societal considerations only truly becomes evident at the micro-level of individual research decisions. Trying to link high-level social and ethical concepts to whole fields of research (“sustainability and food”) only leads to repetition of standard repertoires (“food has to be produced sustainably”). High-level notions can be a relevant placeholder for an area of interest that requires further study, but one has to delve deeper to get to actionable results: (e.g. assessing the life cycle of specific products).

In the courses, RATA considerations proved more relevant/urgent at higher TRLs: while the RATA dimensions of new food supplements or drug delivery systems quickly became obvious to everyone, it proved harder to identify ethical and social issues in relation to fundamental research on Majorana particles (see also the points made by Wim Sinke in Copenhagen).

3) To get to meaningful levels of engagement, plenty of time is required:

- time for the participants to really get to the heart of the matter: acquiring both a solid understanding of the research, and time to reflect on what the social and environmental applications of the research decisions could be.
- one needs to acquire 'interactive expertise' with respect to the disciplines.
- time to get to know each other: as a person, but also with respect to the overall professional perspective, and broader worldviews
- time to probe how the two 'worlds' might connect: meaningful connections between the disciplines

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

- if you want to engage researchers, focus on first-order learning! Meaningful to them, something that addresses *their* problems (see Wim Sinke again).
- This requires that SSH-communities strengthen their 'consultancy' skills:
- from product-driven ("here's my theory, what do you think?") to demand-driven: "how can I help you?")
- clear and compelling examples, presented in a way that non-experts can understand
- be mindful that the nanotech research community does not automatically see the added value of 'opening up' research to broader considerations
- take plenty of time for mutual learning, so you can drill down from abstract notions to meaningful levels of engagement (proposing actions by people that are considered to have meaning and impact): this requires mutual agreement on *what's at stake*, *available options*, and *preferred courses of action*.

NANO DIODE - DEVELOPING INNOVATIVE OUTREACH AND DIALOGUE ON RESPONSIBLE NANOTECHNOLOGIES IN EU CIVIL SOCIETY

Description of the project

From July 2013 to June 2016, the NanoDiod project (<http://www.nanodiode.eu>) organised a wide range of outreach and dialogue activities to support the responsible development of nanotechnologies in Europe. NanoDiod explored the added value of engagement activities at all levels of the research and innovation process: from policy making and research to the diffusion of research outcomes in society. The consortium brought together a range of stakeholders including industry, civil society organisations, researchers from the natural and the social sciences and artists. Different work packages addressed different levels of governance:

- WP2 - INSPIRE initiated engagement and dialogue at the ‘upstream’ level of nanotechnology research policy, organising a public survey on perceptions, a school competition and a series of citizens’ dialogues on nanotechnologies;
- WP3 - CREATE sought to enable processes of co-creation at the ‘midstream’ level of concrete nanotechnology research and innovation processes, organising a series of 3rd generation deliberative processes, user committees and regulatory research workshops throughout Europe;
- WP4 - EDUCATE aimed to professionalise nanotechnology education and training, identifying and selecting the best tools for nanotechnology education and establishing a community of practice for safe working with nanomaterials;
- WP5 - ENGAGE organised activities at the ‘downstream’ level of public communication on nanotechnologies including the NanoTube, NanoBazaar, NanoGallery and NanoSlams.

Brief summaries of NanoDiod activities and outcomes are available through the project fact sheets: <http://www.nanodiode.eu/project/factsheets/>.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The activities in WP3 – CREATE are most relevant to GoNano, as they sought to enable co-creation at the midstream. The central objective of WP3 was to explore opportunities for opening up the research and innovation process to societal considerations by involving societal stakeholders (non-governmental organisations, trade unions, professional end users and consumers) directly in nanotechnology research:

- The *3rd generation deliberative processes* (Task 3.1, led by Harald Throne-Holst and Pål Strandbakken, SIFO) aimed to develop a so-called third generation of deliberative processes in the development of nanotechnology. This task built on the results of the NANOPLAT project, which collected and analysed a large number of deliberative processes on nanotechnology that had been undertaken in Europe and the US. Between June 2014 and September 2015, six deliberations were organised in six different European countries, bringing together some 175 individuals from a wide range of backgrounds to discuss nanotechnologies in a variety of application areas.
- The *user committees* (Task 3.2, led by Pieter van Broekhuizen, IVAM) sought to enable stakeholders to participate in the research and innovation process, modulating research directions in light of societal considerations. Groups of potential users (industrial

customers as well as consumers) were invited to comment on specific, large scale, near-application research projects in nanotechnology, to monitor progress and provide feedback to the research projects, with the aim to integrate societal considerations in the research process.

- The *regulatory research workshops* (Task 3.3 led by Pieter van Broekhuizen, IVAM) aimed to enable a process of ‘regulatory research’, bringing together researchers and industrial partners with risk assessors to discuss sensible ways forward for risk assessment. Three workshops were organised to discuss the requirements for effective risk assessment and the operationalisation of a precautionary approach in risk management of nanomaterials.

Which kinds of stakeholders were involved? At what stage were they involved?

The *3rd generation deliberative processes* (Task 3.1, led by Harald Throne-Holst and Pal Strandbakken, SIFO) targeted researchers, CSOs, industrial partners and policy makers.

The *user committees* (Task 3.2, led by Pieter van Broekhuizen, IVAM) targeted potential nanotechnology ‘users’ (industrial customers as well as consumers).

The *regulatory research workshops* (Task 3.3 led by Pieter van Broekhuizen, IVAM) targeted risk researchers, risk assessors, regulators, industrialists and other policy makers.

How were the co-creation activities/engagement activities/mutual learning events organised?

The events were mostly organised as ‘traditional’ workshops: between 10-25 participants from various backgrounds discussing thematic issues in various nanotechnology areas on the basis of information provided beforehand.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Opportunity: The NanoDiode activities **raised awareness among research and innovation actors** of the need to include a wider group of stakeholders in decisions on the direction of nanotechnologies. They **offered new insights on how to organise dialogue** across stakeholder groups, **facilitated mutual learning**, and in some cases **empowered new groups of stakeholders** to participate in the debate.

Challenge: there was **limited evidence that the mutual learning impacted the decisions of researchers and engineers or otherwise shaped nanotechnology research** and innovation trajectories.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

- Multi-stakeholder collaborations should be **part of formal processes and initiatives, with binding outcomes**, rather than single events on a voluntary basis. Interactions should occur over a **higher number of events and a much longer period of time**. The outcomes of the events should **suggest specific courses of action**, and participants should be encouraged more strongly to **follow up**.
- The NanoDiode experience points out that **getting from constructive dialogue to practical action is a major bottleneck**. To encourage uptake, the discussions 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?
- Technology enactors currently do not see stakeholder involvement as core business. It will only become core business if enactors see the **added value of these interactions in relation to their own goals and objectives**. This requires **compelling examples** that demonstrate how the research improved or how resistance was overcome.

NANO DIODE - WP2: ORGANISING ENGAGEMENT AND DIALOGUE AT THE 'UPSTREAM' LEVEL OF RESEARCH POLICY

Description of the project

From July 2013 to June 2016, the NanoDiode project (<http://www.nanodiode.eu>) organised a wide range of outreach and dialogue activities to support the responsible development of nanotechnologies in Europe. WP2 - INSPIRE initiated engagement and dialogue at the 'upstream' level of nanotechnology research policy, organising a public survey on perceptions, a school competition and a series of citizens' dialogues on nanotechnologies.

Which activity in this project was most relevant for GoNano? Could you describe why?

The surveys and interviews on European citizens' views towards nanotechnology innovation are probably most relevant to GoNano, as they sought to elucidate public attitudes towards nanotechnology innovations. **Between March 2014 and September 2014, NanoDiode conducted an online survey to map European citizens' views on nanotechnologies.** Some 1,500 respondents provided their views on the future impacts of nanotechnologies, preferred areas of innovation and means of communication. The report of the citizens' survey and in-depth interviews summarises the most important findings:²⁴

- The large majority of respondents expected nanotechnologies to have a positive effect on our overall way of life and on European economies.
- Impacts of nanotechnologies on the environment and the safety of European society were viewed with less confidence, although positive views were the majority here too.
- The respondents almost unanimously welcomed application areas that could be directly linked to societal challenges, such as climate change or health.
- They were less enthusiastic towards products that are used close to one's body such as food, cosmetics or textiles. The only exception to this rule is medicine.
- Public institutions, industry and civil society organisations were all considered to be important nanotechnology communicators. Considering different media, print and TV still dominate social media and the Internet.

The survey results were discussed in a total of 60 in-depth interviews, conducted in six NanoDiode partner countries to get a better view of citizens' hopes and fears concerning nanotechnologies. As nanotechnologies are expected to affect the lives of citizens, interviews partners across Europe called for responsiveness to public opinion, recommending early public involvement to shape technological trajectories according to societal needs.

The survey results confirm the findings of earlier studies such as the Eurobarometer and the German project Nanoview.²⁵ These studies consistently show that European citizens are cautiously optimistic about nanotechnologies: they have positive expectations, but they also have concerns about the risks to human and environmental health and to

²⁴ <http://www.nanodiode.eu/wp-content/uploads/2015/01/NanoDiode-D2.1-Report-of-the-citizens-survey-and-in-depth-interviews.pdf>

²⁵ Nanoview was a survey of 88 international studies on public perceptions of nanotechnologies published after 2000. See: http://www.bfr.bund.de/en/press_information/2013/31/unknown_key_technology_what_germans_think_of_nanotechnology-188485.html

societal well-being in general. Citizens generally indicate that they feel poorly informed about the topic and welcome more consumer-oriented information.²⁶

While these findings contribute to our overall understanding of public perceptions towards nanotechnologies, the survey did not present many surprising or novel findings in comparison with earlier work on public perceptions. This led to some discussion within the consortium about the validity and utility of the methods used to gauge public perceptions towards nanotechnologies. The survey sought to move beyond the level of general attitudes, trying to elucidate public preferences for specific areas of innovation and measures to advance responsible research and innovation. At the same time, the questionnaire was kept very short so as to encourage respondents to complete the entire survey instead of giving up halfway through. This left limited room for in-depth questions to explore the motivations behind particular responses. Additionally, complex terms such as ‘responsible research and innovation’ were not explained in detail to prevent framing of the questions and possibly introducing a bias in the responses. But since the questions didn’t specify the exact meaning of key terms, it wasn’t always clear what respondents in fact responded to.

There was also some concern about the validity of asking non-expert citizens for preferred areas of innovation, given very low levels of public awareness of nanotechnologies. If respondents cannot be expected to know what sorts of applications nanotechnologies may bring forth, then what is the value of their estimation of the effects they will have on society? Their responses are more likely to represent public views towards emerging technologies in general, rather than nanotechnologies in particular. This suggests that brief public surveys may not go together very well with the desire to go beyond the level of general attitudes. More detailed, in-depth approaches may be required to inform specific policy decisions on nanotechnologies.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

The outcomes of WP2 above all point to the complexity of the challenge of enhancing the responsiveness of nanotechnology research and innovation policies to public views and preferences. First of all, making sense of the diverging views and preferences of citizens towards nanotechnologies is a challenge in itself. Despite a very general trend of cautious optimism coupled with concerns over health and safety and quality of life, perceptions towards nanotechnologies vary across nations, age, gender and socio-economic backgrounds. They also fluctuate over time in response to new scientific discoveries, policy developments and media coverage. Second, the outcomes of public perceptions research need to be transformed into a form of advice that can be taken up into research and policy decisions. Indeed, it is often difficult to tell what sorts of changes in nanotechnology policies would be needed to align them better with public views and preferences. Public surveys can offer a background view on general public preferences, but they do not automatically offer direct guidance for the direction of research. This suggests the need to ‘translate’ and communicate findings from public perceptions research to policy and research decision making, and to help policy makers to integrate the variety of public preferences in policy decisions.

²⁶ See also the recent Eurobarometer report: *Public opinion on future innovations, science and technology* of June 2015.

DEEPEN

Description of the project

The DEEPEN project (2006-2009) was a three-year project funded by the FP6 program. DEEPEN aimed to establish an integrated understanding of the ethical issues posed by emerging nanotechnologies, develop methodological tools for engaging civil society and the nanoscience community in ethical reflection, and recommendations for incorporating ethical understanding into research practices and governance structures.²⁷ DEEPEN aimed to integrate understanding of the ethical dilemmas posed by emerging nanotechnologies into the innovation trajectories of the technology itself.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Most of the DEEPEN activity is relevant for GoNano. The *de facto* ethics of actors in the nanoscience and nanotechnology world were mapped and approaches to enhancing ethical reflexivity were developed; the associated aim was to examine how ethics and responsibility are understood within the nanoscience community. In parallel, empirical research carried out in the UK and Portugal aimed to uncover the ethical categories of lay people in response to ethical issues posed by emerging nanotechnologies. The aim of this research was to gain insight and understanding into how lay publics view the ethical significance of emerging nanotechnologies and to develop methodologies aimed at the improved characterisation of public views.

Which kinds of stakeholders were involved? At what stage were they involved?

Nanoscience and industry stakeholders, European publics, policymakers. The question as to when they were involved is less relevant, given that the engagement processes aimed to elicit insights into public understandings of nanotechnologies and the 'real world' ethical stances and patterns of argumentation of those actors enacting nanotechnologies. In other words, the temporal aspect of engagement was not important for the purposes of the project. However, the project does make recommendations as to when to involve stakeholders for the optimisation of public engagement exercises (see below).

How were the co-creation activities/engagement activities/mutual learning events organised?

DEEPEN research drew upon group performance and theatrical techniques including the work of the Brazilian dramatist Augusto Boal on the "Theatre of the Oppressed" as a means of engaging publics unfamiliar with emerging technologies and in order to enable them to consider the ethical implications of such technologies. Various sources of data were used to explore the prevalent ethical repertoires for each group (industrialists, policymakers, and nanoscientists). These included dedicated interviews, document analysis and participant observation at meetings. Informal discourse analysis was used to interpret the data. The research focused on ethical stances and patterns of moral argumentation, eliciting justifications for ethical stances and aiming to understand how participants understand 'ethical issues'.

²⁷ http://cordis.europa.eu/project/rcn/84695_en.html

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The following are recommendations made by the DEEPEN project which are of relevance to our planned activities on GoNano.

- *Critically reflect on the standard repertoires of nanoscience and industry:* Standard justifications of nanotechnological development prevail in how scientists and industrialists discuss their work. The repertoires of scientists and industrialists reflect a specific perspective: that the promises of nanotechnology must be pushed and that ethics is a brake on progress. In order to enable critical reflection by developers or “enactors” of nanotechnology and others, it is important that these standard repertoires are opened up. Currently, we see recourse to traditional roles and a focus on concrete issues such as transparency and risk, rather than the background repertoires and divisions of moral labour that shape the debate on such issues.
- *The importance of understanding the complexity of public ‘attitudes’:* A key finding from the DEEPEN analysis is that lay reactions are complex, neither simply positive or negative but rather ambivalent. Moreover, publics are not satisfied with merely weighing up risks and benefits: “Their concerns and enthusiasms go beyond this narrow framing to encompass anything from the dangers of perfection to the problematic nature of controlling life” (p.21). The DEEPEN project recommends moving beyond the language of ‘pro or anti’ and ‘risks versus benefits’ and to acknowledge that judgements about nanotechnology are not easily represented in tick box surveys. Thus, there is a need to think carefully about the ways in which publics are understood and involved in engagement activities.
- *Engage with enduring public narratives:* DEEPEN research found that public responses to nanotechnology can be characterised as being structured by five key cultural narratives, “each of which represent archetypal stories deeply embedded in European culture” (p. 4). They include ‘Be careful what you wish for’; ‘Opening Pandora’s box’; ‘Messing with nature’; ‘Kept in the dark’; and ‘The rich get richer and the poor get poorer’. These narratives “emphasise that technoscience involves risk and uncertainty, and indeed that perceived ‘benefits’ may turn out not to be beneficial at all” (p. 19).
- *Move public debate on nanotechnology from ‘conversation’ to deliberation’* on possible developments of nanotechnology: Public debate should take place in a space that “takes

the issues that arise seriously, and acts upon them” (p. 31). This can be achieved through an emphasis on specific questions and topics.

- *Be aware of the challenges of deliberation:* These challenges include a lack of common ground between groups of stakeholders and laypeople; a lack of certainty regarding the actions and decisions that can or should be taken; and the difficulty of discussing ‘nanotechnology’ given the multitude of applications. Two suggestions are made with respect to how to optimise the potential of such exercises. The sense of inevitability – often present in public discourse – of the irreversibility of certain technological paths should be critically addressed. Questions that can be asked and be opened up to public discussion include “At what stage in the R&D cycle should deliberation take place in order to disrupt this ‘inevitability’? What stakes do different actors have in any deliberation process?” (p. 31). Second, there is a need to find a balance between thinking through the implications of current research and development, on the one hand, and speculation over what may or may not be feasible in the future. Thus, public engagement exercises should focus on both current or emerging research directions and technological developments, while also opening up new spaces for healthy scepticism about the promises and fears associated with nanotechnologies.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

- Both public and professional stakeholder responses to and views on nanotechnology need to be understood. Too often, the success or failure of engagement exercises is attributed to the ‘problematic nature’ of public concerns and views. However, professional stakeholders and nanotechnology developers also come to the table with their own assumptions and standard repertoires, which can hamper opportunities for mutual learning and co-creation. These taken-for-granted standard repertoires should be examined and opened up to debate and critical reflection by all involved.
- Another important message for GoNano is that we need to take seriously the content of lay concerns about nanotechnologies. Moreover, we should endeavour to integrate the values of lay stakeholders in the outcomes of co-creation exercises.
- The DEEPEN team’s final reflection “Even win-win situations come at a cost” is also worth noting. The researchers voice caution about the rhetoric of the win-win situation that characterizes much discourse on nanotechnology (and does so until this day). They argue for the need “to develop a healthy skepticism” of this win-win discourse “including, and perhaps especially, those incorporating references to sustainability and responsibility”. They continue “However seductive the vision of untrammelled technological development with no negative consequences is, thinking in these terms is hindering, not helping, debate on nanotechnology” (p.40).

Resources:

Davies, Sarah, Macnaghten Phil and Kearnes, Matthew (ed.). 2009. Reconfiguring Responsibility: Lessons for Public Policy (Part 1 of the report on Deepening Debate on Deepening Debate on Nanotechnology). Durham: Durham University. Available at: <http://dro.dur.ac.uk/6399/1/6399.pdf?DDD14+dgg1mbk>

FRAMINGNANO

Description of the project

The FramingNano-project was a support action funded through the EU FP7. The project aimed to build a deliberative process that allowed nanotechnology stakeholders to engage in an ongoing dialogue about the governance of nanotechnology development. By focusing on risks and concerns, the project pursued both EHS (Environment, health and Safety) as well as ELSI (Ethical, legal, societal implications). The four main aims of the project included: (1) An analysis and review of existing-proposed regulatory and governance processes. (2) The collection and analysis of positions and needs of stakeholders, enacted through a two-stage Delphi Exercise and a dedicated International Workshop. (3) The design of an appropriate proposal of a Governance Plan, through consultation of experts and a debate among all stakeholders in a dedicated International Conference. Finally (4), a capillary action of communication and dissemination of information on the project and nanoscience and nanotechnology governance. The website of this project included recent news updates on the project and related efforts²⁸. The project was led by AIRI/Nanotec IT (Italy) ²⁹

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The project had a central aim of creating proposals for a workable governance platform. It was based on three activities:

- Analysis of existing and ongoing regulatory processes, science-policy interfaces, research on risk assessment, and governance in nanotechnologies;
- Consultation with all relevant stakeholders to assess attitudes, expectations and needs, and to define a list of key issues be considered during the deliberative phase of the project;
- Dissemination of information on the governance of nanotechnologies, including proposals developed within the project in order to raise stakeholder awareness and obtain further input to the development of a governance platform.

GoNano-project have elements related to all these, not least in trying to etch out governance models. Of the three activities listed, it is perhaps the activity on Consultation that has the closest resemblance to activities in GoNano.

In the project's summing up, they set out the following key requirements and methodological aspects that could strengthen initiatives on public dialogue:

²⁸ The website framingnano.eu is no longer active

²⁹ The consortium: The Innovation Society (Switzerland), The Institute of Nanotechnology-IoN (UK), National Institute for Public Health & the Environment- RIVM (The Netherlands), Fondation EurActiv (Belgium) and Technology Centre (Czech Republic), in addition to the project leaders at AIRI (Italy).

- **Openness and adaptation:** Communicate information in an interactive context with the public, and be open to change the approach in the light of what the 'lay' people have to say.
- **Follow-up:** People must be aware from the outset of what they can expect in the policy process and get feedback on what actually happened.
- **Differentiate:** In the communication, the stakeholders need to clearly differentiate between different risks, concerns, nanomaterials and applications
- **Meaning:** Include the public in the development of principles, values and criteria that guide the governing, assessment and decision making process on nanotechnologies.
- **Independence:** Maintaining the independence of those communicating with the public.

For a governance approach to be effective, the FramingNano-project stated that it would need to facilitate an interaction between all the different actors in the value chain of nanomaterials and nanoproducts, as well as with civil society in general.

Which kinds of stakeholders were involved? At what stage were they involved?

The stakeholders involved in the Delphi-studies were Researchers (with scientific and technical expertise necessary for defining EHS and ELSI); Industry representatives (Product and occupational health and safety are of primary importance); Policy makers (governments, national and international authorities, regulatory authorities, standardisation organisations, lawyers) and Citizens (Civil Society Organisations that demand transparency and openness which can be seen as in the interest of citizens).

How were the co-creation activities/engagement activities/mutual learning events organised?

To collect stakeholder opinion the following multi-step approach was used: a first round of a two-stage Delphi questionnaire was designed (based on in-depth desk analysis on risk governance issues) to identify the broad terms that were considered as the most important and relevant by stakeholders. Then followed a physical stakeholder workshop where member of various stakeholders' organisations got the opportunity to provide their input to the terms identified through the Delphi-study. Then followed the second round of Delphi-questionnaire with the aims to let the different stakeholders reflect and comment of the key themes identified in the first round and the workshop.

This in-depth consultation was essential to **both identify area of consensus and conflicting views of the different stakeholders**. These were condensed in a set of positions on risk governance guiding the debate amongst stakeholders (research, industry, policy, society). **A full understanding of existing stakeholders' positions is essential for a fruitful and effective debate.**

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?

- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Although non-active stakeholders (people who are not directly involved in the development of nanotechnologies, but that are likely to be influenced by them at some point) group had insights on certain parts of the problem under discussion, they faced some difficulties in giving specific, concrete inputs as well as taking position in a sometimes delicate debate. This often resulted in a wait-and-see attitude.

It was recognized that participation to this type of consultations is generally limited to people open and willing to exchange their views and activities.

Other stakeholder groups in the value chain of nanoproducts, may have believed that their mere participation in the dialogue could be viewed as a public recognition that they were involved with nanotechnology (and thus involved with potentially risky products). This could result in that such stakeholders did not completely disclose their activities, or chose not to participate at all ("hidden views"). The analysis of the deliberative process should take into account these aspects: who participated in the deliberation? Are some type of stakeholders, or certain opinions not represented? What other information could be missing?

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Aside from legal issues implicit in regulation which are closely related to the application of nanotechnologies, ELSA were considered to be of lower urgency by the stakeholders involved in the dialogue compared to EHS issues ³⁰.

The concepts of **inclusiveness** (where all interested stakeholders are included and invited to engage in the dialogue), **transparency**, **public understanding and trust**. These were set against an out-dated concept of "engineered consent" (or deficit model) which springs from the belief that public perception can be guided by spreading selected information.

The expectations to nanotechnologies are high, but it is widely shared that the benefits promised will fully materialise only if there is a governance system which addresses, in a timely manner, the potential risks and concerns associated with their development to allow growth and technology exploitation that leads to sustainable applications.

Given the nature of nanotechnologies, an effective governance approach will have to **increase the level of interaction amongst those developing, producing, selling and regulating nanotechnology, as well as with civil society in general**. First then it will be possible to promote a proactive and adaptive process capable of framing the development of these new technologies across known and accepted boundaries. The establishment of **open, transparent, objective and trustworthy communication** will also be necessary .

A broad process is considered vital to ensure that the diverse needs and expectations are adequately addressed to foster the definition of a set of social, political and technical criteria to

³⁰ FramingNano monitored the debate on nanotechnologies in the period 2008-2010

shape a governance framework capable of assuring the responsible development of nanotechnologies.

NANOPLAT

Description of the project

The Nanoplat project (*Development of a Platform for Deliberative Processes on Nanotechnology in the European Consumer Market*) (2008-2009) aimed to develop a platform for deliberative processes on nanoscience and nanotechnology (NS&T) in the European consumer market. The project evaluated deliberative processes concerning human and environmental safety, ethical and moral dilemmas, and perceptions of risks and responsibilities as revealed through a focus on the market interfaces across the value chain of consumer goods. It identified the needs and interests of relevant stakeholders along this value chain, especially focusing on producers, consumers, NGOs and civil society. The purpose of these evaluations was to stimulate a deliberate dialogue, and give scientific support to the stakeholders responsible for this dialogue. Build on the examples reviewed and analysed; Nanoplat was to deliver and to test run a platform for further deliberations, where the ambition was to build a platform that could arrange semi-directed online deliberations between stakeholders from production, consumption, and governance.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

An important task of the project was to deliver and to test run a “platform” for further deliberations, where the project build on the evaluated deliberated processes. The platform was based on an online tool, which would make it possible to arrange deliberations on a European level, cross-nationally. The ambition was to develop a platform where it was possible to arrange semi-directed online deliberations between stakeholders form production, consumption, and governance. An independent third party, the promoter, activates the platform. The promoter takes the initiative, defines the framework, recruits the participants, and monitors the process. The platform should focus on promoting deliberation between large numbers of different types of stakeholders. However, deliberation could also include broader dialogue between stakeholders of similar type in different European countries.

As GoNano will use online consultations, experiences form the online test runs of the platform in Nanoplat will be of most relevance for GoNano.

Which kinds of stakeholders were involved? At what stage were they involved?

Stakeholders from production, consumption, NGOs, civil society and governance were involved in the project. There were a limited number of interviews with people involved in the deliberated processes evaluated in the project. The platform was tested through two stakeholder conferences on the theme “food and nano”.

How were the co-creation activities/engagement activities/mutual learning events organised?

The evaluation of selected deliberative processes were based on secondary analysis (e.g. analysis of documents and evaluations if available) and a limited number of interviews with people involved. More than a dozen deliberate processes were selected for review. The selection

criteria were broad European coverage, variety in types of deliberation, consumer goods focus, availability of data and access to the field. The stakeholders in the deliberate processes evaluated were industrial business, importers, retailers, consumers, scientific community, political authorities, business organisations, consumer and environmental NGOs, European standardisation organisation and organisers of deliberative processes.

In the review of deliberative processes, the project identified a movement from the first to the second generation of deliberation. The distinction between first and second-generation deliberative processes on nanotechnologies is most evident in terms of sophistication of the applied methodology. Second generation exercises are more elaborate than early approaches. They are also more specific processes: they deal with particular application rather than the general relationship between science and society. Responsibility is thus moved from the research community to industry.

The platform was based on an online tool where it was possible to arrange semi-directed online deliberations between stakeholders from production, consumption, and governance. The platform must meet a set of preconditions: It must enable deliberation exchanges at a European basis, the online tool must make it possible to arrange deliberations on a European level, cross-nationally, and the platform requires an independent moderating institution that brings the deliberation forward, define the framework, recruit participants, and monitor the process.

The platform was based on two steps

- Kick-off sessions: The purpose of the kick-off sessions was to bring out a set of key issues while involving a limited circle of experts in a quick interaction process. These sessions consisted of short online conferences and a chat-like tool (keyboard-based) allowing short written fluid exchanges between 5 to 10 participants. The main purpose of this setting was to slow down exchanges between potentially antagonist parties on controversial subjects.
- Open revision sessions: The purpose was to facilitate the emergence of an agreement within a larger circle of stakeholders. These sessions were based on open access online revisions of synthesis emerged from the kick-off sessions. The process was based on a wiki-like tool displaying the synthesis and offering to visitors the possibility to edit them and substitute the former version by a new one. The tool offered also the history of all previous versions, the possibility to restore them, to compare between different version and evidences also changes that have been made. The sessions were designed like this in order to inspire consensus between different stakeholders, their point of view, and their respective interests.

The platform was tested, using Nanoplat consortium members as moderators, through two stakeholder conferences on the theme “food and nano”. The first pilot had four users, three from NGOs and one from political authorities. The second pilot had six participants, two from businesses, and one from research, NGO, authority, and academia.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

The pilot experiment was too short to draw any in-depth conclusions, but it is clear from the experiment that an online deliberation platform is a promising tool for promoting a regular dialogue between various players on the European nanoscience and nanotechnology scene.

In theory, an online tool may enable deliberation processes where participants carry out the discussion autonomously without moderation and without third-party input. However, this ideal deliberation situation will occur only after the platform has existed for a certain time and has reached a certain level of development.

Stakeholders will only use the platform and engage in online deliberations if it is more interesting and rewarding than time consuming and more rewarding than existing alternative activities.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

Based on the pilot experiment in this project an online tool is a promising tool for promoting a dialogue between stakeholders.

An online tool must engage the stakeholders so that it is more interesting and rewarding than time consuming and more rewarding than existing alternative activities.

There is a future for a third generation of deliberative processes in the development of nanotechnology. These processes have to be more specific oriented and more closely linked to the decision-making processes. They may gain from using the platform developed within the Nanoplat project. One of the main challenges in the future is the responsibility for running such processes and independent institutions may take that responsibility. The deliberative processes represent a democratisation of science, and as long as we distinguish between the public discourses and the formal decision-making process, deliberation represents no threat to numerical democracy.

The main elements in the third generation of deliberative processes on nanotechnology are processes where there will be a fruitful combination of classical bottom-up deliberative processes with stakeholder's involvement through hearing systems, standardisations, and Codes of Conduct.

Resources

Strandbakken, Pål, Gerd Scholl and Eivind Stø (eds.) (2013): *Consumers and nanotechnology. Deliberative Processes and Methodologies*. Pan Stanford publishing.

<https://www.nanoplat.org/>

<http://www.nanodiode.eu/publication/nanoplat-platform-deliberative-processes-nanotechnology/>

http://cordis.europa.eu/result/rcn/45892_en.html

http://cordis.europa.eu/result/rcn/86261_en.html

NANOROADMAP

Description of the project

The primary goal of the NANOROADMAP project (2004-2005) was to provide coherent scenarios and technology roadmaps up to the year 2015 to identify the opportunities most relevant for Europe that could materialise in this horizon from nanotechnology application in three specific sectors: materials, health and medical devices, and energy. A specific feature of the project was its two step approach. A first phase, dedicated mainly to assessment of the existing situation and forecasts in the field, both with respect to technology and applications / market, pinpointing the themes most relevant to focus on, identifying experts to involve in the road map exercise, defining the methodologies and the instruments to execute it. This was followed by a second phase dedicated to the preparation of the road maps and dissemination activities, discussions and feedback. The result of the roadmapping exercise was condensed in 12 roadmaps (4 for each sector) which were grouped in 3 sectoral roadmaps reports.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Identification and selection of top-international experts to be involved in the roadmap exercise – this is an important process also in GoNano project. The roadmap exercise carried out with a two steps Delphi-like approach (through questionnaires). Unfortunately, the questions are not available anymore.

Which kinds of stakeholders were involved? At what stage were they involved?

How were the co-creation activities/engagement activities/mutual learning events organised?

The experts involved were predominantly leading scientists in the given field of nanoscience. Their background was mostly academic, then industrial (businesses), private research and other public research sector. As stated above, they were involved through Delphi exercise; no physical workshop was held. In the Czech Republic, the experts (ca 20) were recruited on the basis of personal connections (acquaintance) of the Czech project manager, who rather prevailed on them.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?

- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The NANOROADMAP project presents valuable hints on the expected development of certain directions within the three topics.

For materials, the focus was given to nanoporous materials, nanoparticles / nanocomposites, dendrimers and thin films & coatings. For the topic of medicine and health, the roadmaps focused on drug encapsulation/ drug delivery/ drug targeting, molecular imaging/ biophotonics, biochips/ high-throughput screening/ lab-on-a-chip technology and biomolecular sensors. In energy topic, the selected sub-topics were solar cells, thermoelectricity, rechargeable batteries and supercapacitors and heat insulation and conduction.

To be complete in GoNano topics, the experts in the project also considered that number of possible applications of nano-materials would be the next to largely enter the market in:

- Power and energy: Dye-sensitized solar cells, hydrogen storage, improved anode and cathode materials for fuel cells, thermal isolation
- Health/medical industry: targeted drug delivery, bone growth promoters, transfection reagents, MRI contrast agents, or microbicide creams, contrast agents
- Food industry: packaging using silicates, biolabeling and detection, photo-catalyst water treatments

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

The activities within NANOROADMAP project were focused rather on expected technological developments and application potential in the given fields of nanotechnology; the societal needs or demands were not fully taken into account. Results of NANOROADMAP project can serve as an historical example of anticipated applications of nanotechnologies (which should have taken place by now) at the stakeholder workshops. This input can serve as an ice-breaker to initiate the discussions within all the GoNano topics at the workshops.

RRI-ICT FORUM

Description of the project

The RRI-ICT Forum (*Supporting and promoting responsible research and innovation in ICT*) (2015-2017) project aims at monitoring, analysing, supporting and promoting the RRI approach in information and communication technologies (ICT) research and innovation under Horizon 2020. The project thoroughly explores the two-way interactions between technology and society, and, putting the human at the centre of the analysis, to explore how the digital age can be a true success factor not only for EU's competitiveness but also for EU's values and people. This means that R&I projects move away from being arena of experts in the "hard sciences" only – and open up to the social sciences and humanities, as well as citizens and civil society organisations who can offer different perspectives and creativity, and foster more socially relevant outcomes.

The objectives of the project is

- Fostering a social sciences and humanities (SSH) contribution and RRI approach in ICT and innovation under Horizon 2020.
- To be a team curating the domain in H2020 empowering other projects and the European Commission.
- To be the place to interact for the emerging RRI-ICT community.
- To organise major annual events in which all stakeholders meet and exchange views.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

One of the project's main goals is to develop an open online community platform devoted to RRI in ICT allowing research organizations to connect, identify potential partners (match-making functionalities), exchange information, benefit from tutorials and toolkits, discover success stories, etc. The platform serve as a place where the RRI community can gather and find solutions together. I think the process of developing such a platform is highly relevant for GoNano. Moreover, some of the information from this platform might be relevant for GoNano. Here we can find information on the RRI concept and examples of best practises.

Which kinds of stakeholders were involved? At what stage were they involved?

Not much information on stakeholders involved in the project is available. However, the project states that they will move away from only including experts in the "hard sciences" – and open up to the social sciences and humanities (SSH), as well as citizens and civil society organisations who can offer different perspectives and creativity, and foster more socially relevant outcomes.

The stakeholders are involved in networking through the organization of annual RRI-ICT Forums, multi-faceted and multi-disciplinary events.

How were the co-creation activities/engagement activities/mutual learning events organised?

In order to encourage networking, the team organises annual RRI-ICT Forums, multi-faceted and multi-disciplinary event for stakeholders to meet and exchange view, open and free of charge. They will provide a key periodic opportunity to results of the project and invite organizations and any stakeholders interested in the RRI-ICT topic to contribute, through their exchanges, to

driving the emergence of the RRI-ICT topic. Moreover, online networking and learning is also possible through the RRI-ICT Platform.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

There is very limited amount of available information on this project. The project's website is not up and running and the report summary at the Cordis website is limited.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

The project takes a bottom-up approach allowing solutions and methods to develop RRI to come from researchers themselves, and the project does not aim at imposing its own agenda or answers.

Resources:

http://cordis.europa.eu/project/rcn/194168_en.html

https://digitalenlightenment.org/sites/default/files/users/14/DEF_DUPONT_RRI-ICT-FORUM_Presentation_v3.pdf

http://cordis.europa.eu/news/rcn/123625_en.html

https://rri-ict-forum.nexacenter.org/view/Main_Page

NANOCODE

Description of the project

The NanoCode (A multistakeholder dialogue providing inputs to implement the European code of conduct for nanosciences and nanotechnologies) project was a two-year project founded by the European Commission's Framework Programme 7 (FP7). The aim of the project was to guide the further development and implementation of the European Code of Conduct (CoC) for Responsible Nanoscience and Nanotechnologies research, and to develop a practical implementation assistance tool (the CodeMeter) to help stakeholders assess their performance in complying with the Code's principles. The project rested on four pillars:

1. Analysis of existing/proposed codes of conduct, voluntary measures and practices for a responsible Research and development in Nanoscience and Nanotechnologies research and identification of the relevant stakeholders (WP1).
2. Consultations of stakeholders to assess attitudes, expectations, needs and objections regarding the CoC through a survey (electronic questionnaire and structured interviews) to more than 400 stakeholders worldwide (WP2).
3. Design of a MasterPlan and a performance assessment tool (CodeMeter) enabling the implementation and articulation of the CoC, based on the WP2 consultation phase, a series of national workshops in partner countries and a final international conference (WP3).
4. Communication in a suitable form and to the widest possible audience of project objectives, findings and outcomes (WP4).
- 5.

The project brings together 10 partners representing 8 European countries, plus Argentina, South Africa and South Korea (associated member).

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

Stakeholder consultations in eight European countries (Italy, UK, France, Spain, The Netherlands, Czech Republic, Germany and Switzerland) as well as at the international level. The consultations, made by an electronic survey, structured interviews and focus groups, involved more than 400 stakeholders in the community of nanotechnology worldwide, to assess attitudes, expectations, needs and objections regarding the CoC.

Which kinds of stakeholders were involved? At what stage were they involved?

More than 400 stakeholders in the community of nanotechnology worldwide participated in the project. These stakeholders were representatives from research, institutions, business and civil society organisations, as well as a group of participants from international organisations. 62 % of the stakeholders were involved in research (in academia, industry and public research institutions), while 16 % derived from businesses. The rest belonged to governmental and semi-governmental institutions (governmental departments and agencies, R&D governing bodies, regulatory and standards agencies, etc.) and civil societies (NGOs, consumer associations, labour associations) (Dorbeck-Jung and Shelley-Egan 2013:62).

The stakeholders were involved in the survey consultations that wished to assess attitudes, expectations, needs and objections regarding the CoC. Additionally, a series of qualitative

interviews and focus groups was organised to deepen the country-specific attitudes and to develop detailed recommendations for the CoC.

How were the co-creation activities/engagement activities/mutual learning events organised?

The two main outcomes of the project was the MasterPlan and the CodeMeter. The MasterPlan points out the level of awareness regarding the CoC, as well as the level of its implementation. It presents options and recommendations for revision and implementation of the CoC that are practical, politically feasible and compatible with current guidelines. The CodeMeter helps stakeholders assess their performance in complying with the CoC's principles, and contains 13 guided questions automatically marked to reflect current adherence to the CoC.

The design of the MasterPlan and CodeMeter builds on the insights gained from encompassing stakeholder consultations in eight European countries (Italy, UK, France, Spain, The Netherlands, Czech Republic, Germany and Switzerland) as well as at the international level. The consultations, made by an electronic survey, structured interviews and focus groups, involved more than 400 stakeholders in the community of nanotechnology worldwide, to assess attitudes, expectations, needs and objections regarding the CoC.

In each of the partner countries, representatives from research, institutions, business and civil society organisations contributed to the quantitative survey. Additionally, a series of qualitative interviews and focus groups were organised to deepen the country-specific attitudes and to develop detailed recommendations. Furthermore, a group of participants from international organisations based in Australia, Austria, Belgium, Brazil, China, Denmark, India, Korea, Liechtenstein, Mexico, Norway, Portugal and the United States answered the survey and gave comments and recommendations for the further development of the CoC.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

- A number of content-related, formal and structural issues seem to be stumbling blocks preventing broader stakeholder acceptance and more widespread adoption of the EU-CoC. Large parts of the EC-CoC are written in a distinct Commission language, which may create problems of understanding. The order of the content elements of the EC-CoC booklet puts a lot of emphasis on the political process rather than on the principles and guidelines themselves. These points represent barriers to an intuitive approach to the EC-CoC for most of its target groups. Both the choice of the wording used and the particular structure of the content elements in the EC-CoC booklet should be addressed in the revision of the EC-CoC and be better adapted to the primary target audiences of

the EC-CoC in an easy, simple and short manner. An introduction, outlining who is addressed and what the benefits of using the EC-CoC are, should be added.

- The participants of the NanoCode Survey appreciated the idea for a web based tool as an adequate way to improve a structured informational exchange and as a monitoring system. However, the web based tool is seen as a complementary approach to the strategies of awareness rising, of communication strategies including dialogue processes and targeted information pools, of incentives and disincentives. All of these components, which could support an improved dissemination and communication, including the web, based tool, would need some basic decisions in advance about the concrete profile of the CoC.
- Awareness amongst the EC-CoC target groups is moderate: It is recommended to develop and implement information and awareness raising activities to ensure proper and effective stakeholder engagement and transparency in the revision process as well as in the (further) implementation of the CoC. Awareness of the EC-CoC is a precondition and the first step on the path to implementation. An official EC-CoC platform should be launched informing about past, ongoing and upcoming activities and transparently document the consultation and revision process.
- Concrete criteria should be developed in close cooperation with stakeholders and experts taking into consideration existing initiatives and the experiences made with the CodeMeter prototype. The large pool of experts collected and involved in the Nanocode project should be used in the revision process.
- Today the CoC is voluntary, thereby with no means to be verified, monitored or enforced that cause a lack of pressure. It is recommended to keep the EC-CoC voluntary. But by increasing its specificity and practicability with the aforementioned criteria, it could be aligned to play a role as a voluntary standard.
- Criticism about the understanding of the “accountability” principle has contributed to an overall rejection of the EC-CoC among a considerable number of N&N stakeholders: The explicit attribution of accountability to N&N researchers for potential impacts of their research on future generations seems unacceptable. The EU-CoC should be more specific so that it is clear who needs to do what to be “accountable”. Scientists remain accountable for adopting good scientific practice, but not for what is done with their work by others in the future.
- The role of the “innovation” principle in the EC-CoC remains unclear. A clarification of the roles of the different target groups of the EC-CoC and further specification of suggested actions in relation to the 'innovation' principle should be provided.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

This is something that GoNano can learn from: It is important that the language we use is not too formal and difficult to understand.

The NanoCode stakeholder consultation unveiled that awareness and implementation of the CoC remain very limited to date due to

- Lack of legitimacy: It was questioned whether N&N deserve their own CoC.

- Difficult practicability: Deriving concrete and verifiable actions in practice is hampered by the all-embracing and unspecific character of the principles and guidelines of the CoC.
- Obstacles: Specific contents, formulations and requirements in the CoC have led to a rejection of parts or the entire CoC amongst some of its target groups.
- Lack of pressure: Many deemed it necessary to associate the CoC with incentives, disincentives or penalties (in case of non-compliance) to encourage stakeholders to adopt and comply.
- Poor communication: Communication and dissemination by the EC and Member States do not make the impression that the CoC is of high priority.
- Inadequate commitment: commitment, coordination and lead have been lacking in the light of the very different structural preconditions applying for the implementation of the CoC in different national contexts.

In the light of the identified flaws, stakeholders expressed the need for a fundamental revision of the current CoC and the development of an implementation strategy. This can build up on some unambiguous positive aspects of the CoC identified during the consultation:

- The CoC principles: stakeholders largely agree they are essential aspects to be taken into consideration in the development of nanotechnologies (as well as in emerging technologies in general).
- The voluntary character: the CoC, though acknowledging some weaknesses associated to its voluntary character, is seen as appropriate tool to implement these principles, favouring trust building and confidence amongst stakeholders.
- The broad scope: the CoC encourages dialogue amongst stakeholders and acts as an early warning system for relevant safety and societal issues.

The MasterPlan relies on these outcomes unveiled by the consultation. It provides selected ideas, options and recommendations concerning revision and implementation of the CoC, with a focus on stakeholder preference, practicability, need for structural and substantial changes of the CoC, and compatibility with the governance context of the existing CoC.

Resources

http://cordis.europa.eu/result/rcn/55409_en.html

<http://www.phantomsnet.net/files/nanocode-consultation-synthesis-report.pdf>

http://www.nanotec.it/public/wp-content/uploads/2014/04/NanoCode_MasterPlan.pdf

<http://www.nanotec.it/public/wp-content/uploads/2014/04/NanoCode-CodeMeterToolReport.pdf>

Dorbeck-jung, Bärbel and Clare Shelley-Egan (2013): "Meta-Regulation and Nanotechnologies: The Challenge of Responsibilisation Within the European Commission's Code of Conduct for Responsible Nanosciences and Nanotechnologies Research." *Nanoethics* 7:55-68.

NANO-BIO-RAISE

Description of the project

The NanoBio-RAISE (*Nanobiotechnology: Responsible Action on Issues in Society and Ethics*)-project (2005-2008) was a three-year project funded under the Science and Society Activity Area by the FP6 programme. The coordinator was the Dutch Technische Universiteit Delft. The project aimed to combine science communication with research on ethics in nanobiotechnology. The activities were an expert working group on human enhancement, horizon-scanning workshops, seminars to assess public opinion, a citizen engagement game, briefing papers, information and dissemination and two international advanced courses on “Public Communication and Applied ethics of Nanotechnology”. As the project is quite ‘old’, less documentation is available than would be desirable.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The best documented activity of the NanoBio-RAISE project was on the two advanced courses on “Public Communication and Applied Ethics of Nanotechnology” (Thesis of Schuurbiers, 2010). The courses were highly interactive between participants with a multi-disciplinary background, so that speaks to facilitation communication and engagement for people with varied, transdisciplinary backgrounds. In addition it concerned nanotechnology.

Which kinds of stakeholders were involved? At what stage were they involved?

Those that participated in the advanced courses were postdocs and faculty with diverse backgrounds medical sciences, chemistry, physics, law, science communication and philosophy. These courses were arranged in the 2nd year of this 3-year project.

How were the co-creation activities/engagement activities/mutual learning events organised?

These were quite extensive arrangements with one-week intensive courses with combined lectures and hands-on training. Although one could say that the activities were aimed at sensitizing scientists to ethical and societal concerns, there was definite elements of mutual learning. The aim was to enable the natural scientists to make links between their own work and broader ethical and societal issues, and the other way around for the participating social scientists and people from the humanities: Give them a certain scientific knowledge base.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

How to organise productive co-creation meetings?

The procedural requirements for successful stakeholder involvement?

Inspiring outcomes?

Good practices?

Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Schuurbiers point to three elements that encourage multidisciplinary engagement and building interactional expertise:

- A shared knowledge-base among participants
- Multidisciplinary skills: being able to communicate about one's work without scientific jargon, and to apply different perspectives on one's work as well as improving rhetorical skills.
- The courses were viewed as a stepping stone towards increased collaborations between representatives from different disciplines. And that participants would be working as 'amplifiers' at their own workplaces when they returned there.

On a more sobering note, the organisers reflect that it remains an open question on how to motivate and encourage scientists to engage and participate in ethical deliberation efforts.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

This project points to the **need of tailoring information** to different stakeholders, for instance with regard to their disciplinary background. At the same time is it important not to turn up the ambitions on how much participants have to know in detail about a particular theme to be able to have a meaningful conversation about the issue at hand.

Engagement is often created when participants find that the exercise is meaningful and that it is something they can use at work or in their everyday life.

Hands-on approaches to complex issues are often appreciated and welcomed.

A good learning environment is important in multi-disciplinary groups, and an important element is a **trustful atmosphere**. It is not straight-forward to create just that, but efforts should be invested to try to achieve this.

THE GENETICS CLINIC OF THE FUTURE (GCOF)

Description of the project

The Genetics Clinic of the Future (GCOF) project is a two-year ongoing project funded by Horizon 2020 that aims to ensure that the clinical implementation of genome technologies is relevant and responsive to the needs of all. The project examines the wicked challenges that surround the clinical implementation of the new technology used for next-generation sequencing (NGS) of DNA so that the needs, interests and concerns of patients and other relevant stakeholders are taken into account in the future. The project offers a stepping stone approach towards the genetics clinic of the future, engaging all stakeholders involved in a process of mutual learning and information exchange.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

The most relevant activity in the project for GoNano was the simulation project initiated by the GCOF as a practical example of a mutual learning process because it enabled the consortium to go beyond the theoretical consideration of the challenges ahead. The stakeholders used their own whole genome sequence data to explore the technological feasibility as well as the personal, societal and clinical opportunities and uncertainties of using genetic information in a medical context and beyond. The objectives of this mutual learning process was to

- foster broad public engagement/engage relevant communities
- enable mutual learning between citizens and professionals
- integrate the lessons learned into other project activities
- experiment with the possibilities of a European group of citizen “ambassadors” from various levels of society who can act as mediators or “knowledge brokers” in the development of the genetics clinic of the future.

Which kinds of stakeholders were involved? At what stage were they involved?

The project brings together 12 key partners from 10 countries across Europe who represent the breadth of stakeholders involved in the genetics clinic of the future: genomics research, clinical genetics, bioinformatics, public health, policy making, patient representation, education, commercial genetics and bioinformatics services, social research, communication, responsible innovation and ethics and law. The consortium also represents a variety of organisation types, including research organisations, businesses, policy makers, civil society organisations, education establishments and science and society centres. The stakeholders worked closely together to develop five fundamental elements of the genetics clinic of the future: data sharing and control, informed consent, patient and citizen involvement, and the role of genome data within and beyond the clinic. The different disciplines did not work in parallel, as is often the case, but were collectively involved from the problem definition to the design of solutions.

How were the co-creation activities/engagement activities/mutual learning events organised?

The outcome of the project was to develop a framework using a “stepping stone approach”. The stepping stone approach is a multi-level process to discuss the topic with different groups. The framework was defined as a collection of multiple temporary, focused initiatives as part of larger research programmes and consortia (the “stepping stones”).

As an example of the stepping stone approach, the GCOF initiated a simulation project where the participants performed whole-genome sequencing on themselves to experience what having your own genome data at your hand really meant. First, there was discussions in seven homogenous groups. These groups were senior citizens, family doctors, teachers, young people, students, science communicators, and patient/support groups. Then they recruited volunteers from each group, who acted as “ambassadors” between the project consortium and their peer-groups. First, these ambassadors discussed among peers. Thereafter, there was organised workshop(s) where the agenda was dialogue between the ambassadors in all the seven groups. Finally, there was organised a mutual learning workshop where both the ambassadors and the GCOF members participated.

The whole genome data was used as input for the following specific activities:

- to monitor and assess the moral and psychological questions that potential participants experience upon receiving this offer (as “models” for visitors of the genetics clinic of the future, although these individuals were not representative of a wider patient population, this process provided vital insight into the challenges that the genetics clinic of the future will encounter);
- to explore what “informed consent” means in this case, and design a consent framework on the basis of these explorations;
- to allow participants to analyse and interpret their own genome data, and to discuss issues of quality assurance;
- to discuss retrospectively which results the participants considered most useful (and to compare this with current plans for feedback);
- to discuss ways to share participants’ data within the consortium and beyond, given that the participants themselves were the formal owners of the data, and taking into account different personal preferences;
- to derive policy implications.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The opportunity of initiating a practical example for the mutual learning process enabled the consortium to go beyond the theoretical consideration of the challenges ahead. The idea was that first-hand experience would elucidate much more clearly what is at stake for prospective visitors of the genetics clinic of the future. This experience would inform the professional decisions of participants so that moral considerations would become embedded in future design of data sharing infrastructures; and conversely, that ethical and legal frameworks such as consent systems or regulations would be better attuned to technological realities. This insight is relevant for GoNano, as GoNano will bring together stakeholders to co-create concrete product suggestions.

A challenge was that the simulation project did not claim to provide any final answers to the wicked challenges around clinical implementation of next-generation sequencing technologies. However, it advanced the debate and provided tools to support personal exploration of the data.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

- A practical example for the mutual learning process enable the stakeholders to gain first-hand experience that will clearly elucidate what is at stake.
- The different disciplines did not work in parallel, as is often the case, but were collectively involved from the problem definition to the design of solutions.

Resources:

<http://www.geneticsclinicofthefuture.eu/>

http://cordis.europa.eu/project/rcn/194066_en.html

<http://www.geneticsclinicofthefuture.eu/wp-content/uploads/2017/06/Policy-Brief-on-Genetics-Clinic-of-the-Future.pdf>

ASSET

Description of the project

ASSET (*Action plan in Science in Society in Epidemics and Total pandemics*) is a 48 month (2014-2017) Mobilization and Mutual Learning Action Plan (MMLAP), which is funded by the European Union's Seventh Framework Program. The main goal of the ASSET project is to develop a comprehensive strategy for a better response to infectious diseases by improving dialogue and cooperation between science and society. The overall objective of ASSET is to contribute to incorporating Science in Society issues (public engagement, ethics, gender perspectives, science education, communication and access to and dissemination of scientific information) into the system of Research and Innovation related to pandemic preparedness. This will be done by:

1. Forge a partnership with complementary perspectives, knowledge and experiences to address effectively scientific and societal challenges raised by pandemics and associated crisis management
2. Explore and map SiS-related issues in global pandemics
3. Define and test a participatory and inclusive strategy to succeed
4. Identify necessary resources to make sustainable the action after the project completion

The project's activities:

- Build a common approach and create a common language to be used in a cooperative multi-actor and multidisciplinary action
- Review existing studies on pandemics, their wider societal implications, research and innovation, governance mechanisms
- Carry out a public consultation on pandemic preparedness and governance
- Mobilise relevant stakeholders and actors and promoting mutual learning mechanisms
- Contribute to restoring trust among scientists, researchers, policy makers and the general public.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

The project considered the citizen consultations as one of the very successful parts of ASSET. The organisation of citizen consultations in 8 EU countries (Denmark, France, Switzerland, Ireland, Norway, Italy, Bulgaria, Romania) had the same standardised method, based on the "World Wide Views" method combining simultaneous national face-to-face citizen consultations with a web-based transnational comparison of national results. The 8 citizen consultations were conducted with balanced citizen samples of about 50 persons in each country, in total 425, with a near representative gender balance. These workshops were very good examples of engaging citizens in debates on issues dealing with pandemics. The information received and the subsequent analysis of corresponding data was used to obtain policy-making recommendations along the 6 broad topics chosen for the workshops. As GoNano also will organize citizen consultations and workshops, I think insights from this project's activities are relevant.

Which kinds of stakeholders were involved? At what stage were they involved?

The project targeted six groups of stakeholders:

- International, national and local organizations and authorities
- Healthcare professionals
- Scientific community
- Industry
- Media
- General public

The Asset project developed an Action Plan including several initiatives and tools addressed to the above main group of stakeholders. All of these actions were aimed at an interdisciplinary involvement of different actors, enhancing dialogue and mutual knowledge both through virtual means (website, social networks, call-conferences, community of practice, bulletins and newsletters) and personal meetings (high Level Policy Forum, local initiatives, Geneve Festival, workshops and conferences).

A strong peculiarity of ASSET project was a simultaneous citizen consultation in eight different European countries (Bulgaria, Denmark, France, Ireland, Italy, Romania, Norway and Switzerland), with a full-day initiative of information, discussion and engagement of citizens in preparedness and response towards crises caused by emerging outbreaks, epidemics and pandemics.

How were the co-creation activities/engagement activities/mutual learning events organised?

ASSET strategy aims at creating a channel of two-way communication between experts and the public, whose beliefs and attitudes should be considered in pandemic preparedness and response plans so that there can be built a more resilient society that is able to tackle such emergencies.

A series of consultation meetings was conducted with citizens in selected countries, with the dual objective of: (a) inciting the participation of different actors in public debates on questions related to epidemics and pandemics; and, (b) developing specific examples of coordinated consultation that may give concrete input to policy making.

The Mobilisation and Mutual Learning (MML) actions include the use of social media as a source of information and mobilisation, the identification and promotion of best practices and the organisation of local initiatives aiming to transfer/enrich the most effective policies and practices to deal with pandemics. The MML actions were supported by a series of communication activities, as well as actions targeting high-level policy making where a High Level Policy Forum (HLPF) is planned to be formed in order to comment/enrich/promote project findings, in addition to policy watch actions that collect and disseminate to a wide audience relevant developments in the policy sphere.

The Best Practice Platform, a web-based, ongoing, collection of candidate best practices on SiS related issues in scientific and clinical research on pandemics, will be sided by a Stakeholder Portal. The Stakeholder Portal provides a gateway for interested stakeholders, organizations, institutions, universities and other relevant actors to register their interest in becoming involved in the discussion on these practices and on issues that needs the creation of new ones. Taking into the account the collected practices and feedback gathered in the Stakeholder Portal,

a section of the Best Practice Platform will be devoted to the development of guidelines for the development of best practices.

Commitment to RRI, which includes a claim to open access science, is another peculiarity of ASSET project. A biannual RRI newsletters, devoted to Responsible Research and Innovation in the field of antiviral drugs and vaccines, will target researchers both in academia and industry. The newsletter will present the progress of the ASSET action and will keep researchers abreast on the most update news about RRI in their research field

ASSET Summer School are good opportunities for experts of different disciplines to meet and share their knowledge and opinions.

Finally, the ASSET website hosts contents by different experts and backgrounds.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The citizen consultations were very good examples of engaging citizens in debates on issues dealing with pandemics. The information received and the subsequent analysis of corresponding data was used to obtain policy-making recommendations along the 6 broad topics chosen for the workshops. The questions had to be identical in all countries in order to allow for cross-national comparisons. To ensure comparability of results and clear communication to policy-makers, the questions and response choices were predefined in all sessions but the open policy recommendation session.

Resources:

<http://www.asset-scienceinsociety.eu/>

<http://community.asset-scienceinsociety.eu/>

http://cordis.europa.eu/result/rcn/202533_en.html

http://cordis.europa.eu/result/rcn/178001_en.html

CIVISTI

Description of the project

CIVISTI was an EU project funded under FP-6 of the European Commission (2008-2011). It was coordinated by Teknologiraadet - The Danish Board of Technology (DBT), DK³¹. CIVISTI was an EU-wide collaboration which aimed at evaluating relevant topics and priorities, offering different perspectives on pressing societal issues. Through CIVISTI, a new qualitative foresight-method was developed and tested in seven EU-countries. ITA conducted this process in Austria. Every country involved 25 citizens, male and female, that were selected by predefined criteria. They developed visions on a future in 30-40 years from now, discussing their hopes and fears on a personal, a societal and a European level. The collected catalogue of visions was then presented to experts and stakeholders from the areas of technology foresight and technology policy. They formulated recommendations which were presented within the scope of the EU-framework programme Horizon 2020. The involved citizens again discussed and prioritised the recommendations. In January 2011 the project team came together with the participants, scientists and members of the European Commission (DG RTD) at a policy workshop in Brussels to present and discuss the results (Source: www.oeaw.ac.at/ita).

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The overall aim of CIVISTI was to integrate different visions and ideas about the future for empowering citizens' perspectives on (political) agenda setting in regard to science funding of the EC. For GoNano, especially the development of the method is of interest since GoNano's Pilot Studies borrows partly from this process when it comes to citizen – stakeholder – interaction and workshop organization.

In general, the CIVISTI process comprises the following steps:

1. Framing: At the framing stage it was decided what should be the aim of the deliberation process. Furthermore an information material was developed for the citizen panels and a detailed process for the first citizen consultation was planned.
2. CC1 – First citizen consultations producing citizens' visions
3. Analysis of the visions and creation of an analytical model for expert-stakeholder workshop
4. Expert-stakeholder workshop extracting recommendations from visions: In the Expert-stakeholder workshop 18 experts and stakeholders worked for 2 days on extracting recommendations for future S&T from the citizens visions.
5. CC2 – Second round of citizen consultations evaluating the policy recommendations
6. The results were presented and debated at a policy workshop

³¹ Partner organizations were: National Consumer Research Centre (NCRC), (FN); Instituut Samenleving en Technologie (IST), (BE); Malta Council for Science and Technology (MCST), (MT); Applied Research and Communication Fund (ARC Fund), (BUL); Medián Opinion and Market Research Institute (Median), (HU); Austrian Academy of Sciences, Institute of Technology Assessment (OeAW-ITA), (AT).

7. Support from a web-based content coordination tool developed in the project (CIVISTI final report p.11)

Which kinds of stakeholders were involved? At what stage were they involved?

“The 18 participants in the workshop were recognised national and European experts, stakeholders and policy makers, including scientists, policy analysts and representatives of governmental bodies, involved in research policy making and implementation” (CIVISTI final report, p.24). Due to the issue at stake (agenda setting for the European Commission’s research funding), the main stakeholder involved were policy makers and experts. For integrating stakeholders as industry, CIVISTI does not offer specific recommendations. Nevertheless, the method of the workshops themselves may be useful to the GoNano project.

The CIVISTI stakeholders were involved at stage 4 and 6 (see above), for developing recommendations out of visions and for dissemination and feedback. Stage 4 (stakeholder workshop) is described in detail in the CIVISTI final report: “The workshop lasted for two working days. During the first day, the participants were divided into 6 groups of 3 experts per group, facilitated by a member of the CIVISTI consortium. Each group were instructed to discuss 6 specific themes related to the visions (based on a previous analysis of the visions), to which 1-3 key vision were assigned. In about one hour per theme, the participants made “draft recommendations” related to the visions. More than 100 recommendations were produced and at least one for each vision. During the second day, an “open space” process was organized to elaborate the recommendations that the participants found most important (about 30 were selected). The participants were instructed to elaborate and finalize draft recommendations by reflecting three criteria: novelty, essentiality and timing. Using an internet-based tool, the final recommendations were documented and compiled to an edited summary document. The main result of the expert-stakeholder workshop is the list of 30 elaborated recommendations” (CIVISTI final report, p. 24f).

How were the co-creation activities/engagement activities/mutual learning events organised?

With regard to the specific requirements of the project, each of the steps of the CIVISTI project is precisely defined:

“The CIVISTI methodology consists of three overall steps. First citizens around Europe were asked about their visions for the future. Seven Citizen Panels of 25 people were established, one in each of the CIVISTI partner countries. The people in the panels were not representative for each country, but they were selected to ensure diversity in the panel and there were some basic criteria for the selection (gender, age, education and occupation). Each Citizen Panel made a long-term view into the needs, wishes, concerns and challenges of the future through a process of deliberation, informed by introduction material and expert and stakeholder input.

Secondly experts and stakeholders analysed the citizens’ visions and transformed them into research agendas and policy options for European research in a two-day expert- and stakeholder workshop. The framework for extracting new S&T policy options from citizen visions practically was inspired by Kingdon’s (Kingdon 1995) streams model of policy agenda setting, which is a widely applied approach in policy analysis. The overall result of the expert- and stakeholder

workshop was a list of recommendations for research agendas and policy options derived from the citizens' visions.

*Thirdly these results were given back to the citizens in the third step of the process where the citizens validated and prioritised the new S&T agendas and policy options before the results were presented to the relevant policy makers at a Policy Workshop" (Final Report CIVISTI, p. 9). However, a certain trade-off between citizen visions and expert-stakeholder recommendations and deriving pitfalls has been pointed out in the CIVISTI evaluation report. Here, issues such as an unclear "context of assessment" (p.57) was pointed out, meaning that there are translational costs between frames of relevance of citizens and stakeholder/experts (e.g. focus on *how* visions are implemented vs. plain R&S related recommendations). Following in-depth small group deliberation was said to understand the respective (here: citizens') criteria of assessment better. As it is stated in the report, «the relation between visions and recommendation was ambiguous which also had an effect on the assessment criteria which became less clear to citizens. More time would have been necessary for citizens to comprehensively compare visions with recommendations – probably there should have been more opportunities for the citizens to describe and record the characteristics of these relations.» (p. 59) Also, «we think that the questions – "What is a good recommendation from the view point of citizens?" and "What is a good vision from the view point of experts?" – could have been discussed in more detail and could have been more directly connected to the actual assessment of recommendations/visions.» (p. 59)*

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

As CIVISTI aimed for empowering citizens' role within the STI governance system via influencing agenda setting in research funding, the openness of processes at the visioning stage cannot be stressed enough. While the CIVISTI methodology provided a frame for the process of visioning (e.g. with regard to time-frames for thought experiment), citizens did have the chance to openly discuss their ideas about a (broad) future. In order to keep the empowering quality of the CIVISTI method, certain openness and flexibility for re-framing and priority setting has to be guaranteed. While selections of visions was taking place early on in the process, a concretization of visions into recommendations and concrete ideas eventually took place in the stakeholder workshop, thus adding another quality of information.

On a more practical level, challenges of the CIVISTI method have been summarized in the CIVISTI final report (p.37). There, the following factors are stressed:

- Difficult to keep attention of citizen panels (drop out of participants)
- Translation in the process (between national languages, between different groups of stakeholders, between experts and lay people)

- Challenge due to broad scope of visions & recommendations.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Regarding recommendations, the following two points cannot be stressed enough: First, to clearly communicate what is expected of stakeholders' participation and second, to well prepare facilitation to support this aim. In order to do so, facilitation trainings and precise facilitation plans were proven helpful.

Resources:

<http://epub.oeaw.ac.at/ita/ita-dossiers/ita-dossier027en.pdf>

<http://epub.oeaw.ac.at/ita/ita-dossiers/ita-dossier008en.pdf>

Final report: http://civisti.org/files/images/Civisti_Final_Report.pdf

Evaluation report: http://www.civisti.org/files/images/D_6_3_Evaluation_report.pdf

NERRI

Description of the project

NERRI (Neuroenhancement and RRI) was a Mobilization and Mutual Learning action funded under FP-7 of the European Commission, running from March 2013 to May 2016. The consortium involved 18 partner institutions in 11 countries, coordinated by Ciência Viva (CV), PT³². The main objective of the project was to foster the public debate on neuroenhancement and to develop recommendations of how the EC should proceed responsibly with the issue. Based on expert interviews who provided information on state of the research and possible applications of NE techniques (both substances and devices), NERRI focused on dialogues between different groups (experts, stakeholders, publics). Innovative formats were developed and tested to support deliberation on the issue of NE between different groups on the same eye level and to provide opportunities for participants to understand and enact different perspectives. In the run of NERRI, over 60 Mutual Learning Exercises (MLEs) took place all over Europe, partly in more traditional formats to enable in-depth deliberation on the issue, partly in innovative locations to increase outreach and to motivate people to participate, partly with innovative formats such as card games (PlayDecide), events for minorities (e.g. hackathons), role playing exercises, and movies and documentaries to trigger discussions.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

For GoNano, NERRI may provide insights in ways of how to get different groups of participants engaged and how to target them.

Participants usually found Mutual Learning Events (MLEs) interesting (according to on-spot evaluations); however, no systematic evaluation took place. The aim of NERRI was to mobilize and engage different groups of stakeholders and the publics and to experiment with new formats to trigger discussions. The MLE concept not only builds upon decentralization but also on mutuality. Experts and lay audiences discuss and learn from each other instead of experts simply informing lay people about 'facts'. This said, any public debate needs expert input to provide orientation knowledge; however, lay people should not simply reproduce a quasi-scientific discourse. Therefore, the MLE debates focus on expected futures, risks and possibilities more than on established expertise. Uncertainty, ambivalence, hopes, fears and diverging points of view can so be addressed before public opinion has crystallised (Fuchs, Torgersen, Bauer 2015).

However, with regard to GoNano, one has to take into account different technological realities of NE and Nano. Compared to NE, which might be prevalent as social practice and vision, but were

³² Consortium partners were: Radboud University Nijmegen (SKU), NL; Stichting Katholieke Universiteit Brabant / Universiteit van Tilburg (UVT), NL; Scuola Internazionale Superiore di Studi Avanzati (SISSA), IT; Universitat Pompeu Fabra (UPF), ES; Universität Linz (JKU), AT; Experimentarium (EXP), DK; Österreichische Akademie der Wissenschaften (OeAW), AT; Közép-Európai Egyetem (CEU); Universität Stuttgart (USTUTT), DE; Genetic Alliance UK; Haskoli Islands (Uol), IS; Johannes Gutenberg Universität Mainz (MAINZ), DE; London School of Economics and Political Science (LSE), UK; King's College London; Instituto de Biologia Molecular e Celular (IBMC), PT; Fondazione Toscana Life Sciences (TLS), IT.

hardly any determined research activity is going on, hence stakeholders are scarce, nanotechnologies are already available on the market (hence, no ‘early-on’ engagement anymore). Thus, debates may differ considerably, e.g. when it comes to concrete interests, state of knowledge on both technologie(s), materials and side-effects, concrete regulatory requirements etc.

Which kinds of stakeholders were involved? At what stage were they involved?

On the level of the project consortium, stakeholders involved were mostly third sector actors, e.g. NGOs and patient organizations which were interested in NE for different reasons. Other than that, NERRI was carried out by mainly either research organizations (universities, external research organizations etc.) or organizations working in an educational context (e.g. museums, exhibitions, etc.).

On level of events, however, involved stakeholders varied widely, ranging from policy makers to active researchers in the field, to possible users of neuroenhancement (e.g. certain professions), vulnerable groups (e.g. burnout patients, students) and a generally interested public.

How were the co-creation activities/engagement activities/mutual learning events organised?

The organization of events was up to the partner organizations, including choice of format, locations, number of people invited etc. It was decided that way to enable a culturally sensitive way of engaging with different groups as it was suspected that the prevalence of the issue of NE was very different from country to country and, in accordance to this, also the discussion and values linked to it (which turned out only partly to be true). The «cultural sensitive way» was rather a general idea for giving national flexibility. And in the end no systematic comparison was undertaken.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The MLEs helped to overcome the reluctance to debate contentious issues around neuroenhancement and gave illuminating insights. However, they did not provide closure on controversial aspects around the issue. While deliberation may provide valuable information, it is easy to predict that dissent and controversy will remain in future engagement procedures on the topic as well (Fuchs, Torgersen, Bauer 2015).

NERRI provides ideas about formats of dialogue (stressing 2-way communication and innovative/ playful approaches), but the extent to which co-creation happened, varies. In hindsight of the fact that the issue needs to be recognized as such (e.g. technological development needs to keep up with people’s visions of it, otherwise the discussion tends to become hypothetical). A possible re-framing of the issue needs to be guaranteed in order to

enable dialogue and interest of participants, e.g. re-framing NE in terms of competitive society, questions of normality and quality of life rather than in relation to technical questions.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

From the experience of the MLES we can identify some key factors for enhancing the depth and quality of the debate, facilitating the exchange of arguments in a productive discussion:

- A carefully chosen ambience and place, i.e. the local setting of an event;
- An adequate set of instruments and devices, e.g. games, visuals, do-it-yourself tools to facilitate addressing abstract issues in an easy way to grasp;
- Sufficient interactivity of the participants during the event;
- The use of stimulating genres of the imagination such as theatre, art, cinema etc. (Fuchs, Torgersen, Bauer 2015).
- Carefulness regarding the pre-framing of issues by experts: NE was not perceived as an issue per se by participants who rather emphasized societal circumstances, such as perceived increasing competition.
- Be careful whether the issue is one for the actors in the field (NE not as issue due to high research costs and no applications).
- Be careful about knowledge gaps about technologies/ technological realities
- Be careful about reinforcing knowledge hierarchies (e.g. experts elaborating on expert perspective through innovative means).

Resources:

Fuchs, Daniela; Torgersen, Helge; Bauer, Anja (2015) Implementation Plan: Towards a White Paper on Neuroenhancement. Deliverable Report 4.1 for NERRI WP4: Governance of RRI. Wien.

Zwart, H. et al. (2017) Reflection as a Deliberative and Distributed Practice: Assessing Neuro-Enhancement Technologies via Mutual Learning Exercises (MLEs). Nanoethics. https://www.researchgate.net/publication/315629727_Reflection_as_a_Deliberative_and_Distributed_Practice_Assessing_Neuro-Enhancement_Technologies_via_Mutual_Learning_Exercises_MLEs [accessed Nov 26 2017].

PROSO

Description of the project

PROSO (Promoting Societal Engagement in Research and Innovation) is a transdisciplinary research project funded by the European Commission under the Horizon2020 programme (January 2016 - February 2018). The PROSO consortium is coordinated by Dialogik gemeinnützige Gesellschaft für Kommunikations- und Kooperationsforschung mbh, a non-profit research company based in Stuttgart, Germany and consists of eight partners, including four research organizations, one research-oriented CSO, one European industry association and two strategy consulting firms. The aim of PROSO is to provide guidance on how to encourage engagement of citizens and third sector organizations, like non-governmental organizations (NGOs) and civil society organizations (CSOs), in Europe's research and innovation processes. In order to identify potential barriers and incentives for CSO and citizen engagement in research and innovation the project conducted a) a comprehensive literature review, b) nine case studies of CSO engagement in the areas food & health, nanotechnology and synthetic biology, c) citizen panels in five countries, discussing the willingness of citizens to participate in various engagement formats and d) a multi-stakeholder conference, discussing the initial results. The main output of the project will be a policy and practice guide on how to foster societal engagement under the terms of RRI.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

PROSO provides useful insights into the perspectives of citizens and CSOs (and partly other stakeholders) in regard to what encourages or discourages them from participating in engagement processes. In this regard the results from the interviews in the context of the nine case studies, the citizen panels in five countries and the multi-actor conference provide important guidance on how to foster engagement. Particularly in regard to the case study PROSO provides secondary experiences on stakeholder involvement rather than first-hand experience (by involving stakeholders directly).

Which kinds of stakeholders were involved? At what stage were they involved?

Citizens were involved twice in citizen panels in five countries, discussing their willingness and concerns in regard to their potential participation in different engagement formats (citizen panel 1) and reflecting on identified barriers for citizen engagement and potential ways to overcome them (citizen panel 2).

PROSO involved CSOs, researchers, representatives of public funding agencies and industry representatives in interviews in the context of the nine case studies. Moreover, stakeholders researchers, CSO representatives, policy and administrative actors, industry representatives and engagement practitioners were involved in the multi-actor conference (June 2017, Brussels), discussing the preliminary results and policy and practice options.

How were the co-creation activities/engagement activities/mutual learning events organised?

The citizen panels followed a common methodology (see Kosow et al. 2016) but were organized by the respective partners in the five countries (Austria, Bulgaria, Germany, Portugal, and the

UK). Partners were responsible for recruitment and the adaptation of the material for their country.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

As mentioned above, PROSO mainly provides analytical insights on the perspectives and experiences of citizens, CSOs and other stakeholders rather than first-hand experiences on stakeholder engagement. These analytical insights, however, are highly valuable for GoNano, pointing to factors of willingness of citizens and CSOs to participate in engagement activities. PROSO has identified six key barriers: perceived lack of relevance; perceived (or real) lack of impact; perceived lack of legitimacy; lack of trust and critical views of others; perceived lack of knowledge and skills; and perceived lack of time and finances (see Table below).

BARRIERS TO ENGAGEMENT

	Lack of relevance	Citizens and third sector actors may perceive an engagement process as not relevant to their own interests, concerns, and goals.
	Lack of impact	Citizens and third sector actors may refrain from accepting an invitation for engagement when they expect the process to have little or no impact in terms of policy or societal effects.
	Lack of trust and critical views of others	Citizens and third sector actors may refrain from engagement when they distrust the agendas of sponsor(s) and organizer(s) of the engagement process or have negative views of other participants.
	Lack of knowledge and skills	Citizens and third sector actors may refrain from engagement when they fear they lack the necessary knowledge and skills to engage in research or in research and innovation policy.
	Lack of time and financial resources	Citizens and third sector actors may refrain from engagement when they fear they lack the necessary time and financial resources to engage.
	Lack of legitimacy	Citizens and third sector actors may refrain from engagement when they have doubts about the legitimacy of the engagement process or their own involvement.

Source: PROSO Support Tool for Fostering Societal Engagement (2018)

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

PROSO offers a range of policy and practice options on how to foster societal engagement. While the main focus is on the more strategic level of policy-makers and funders, the guide also offers more short-term oriented guidance for engagement practitioners that can be of relevance for GoNano:

- Ensure full transparency about the engagement process from recruiting participants on, including transparency about:
- Roles and responsibilities of all actors involved
- Engagement rationale (i.e. why they are recruited, what are expectations in regard to representativity etc.)
- Make clear how dialogues about newly emerging technologies will be related to everyday-life, or personal/ organizational interests
- Expected impacts (e.g. co-shaping technologies or policies or prompting dialogue and deliberation in civil society)
- Be open towards outcomes – consensus as only one option, leave room for disagreement and establish provisions for possible conflicts.
- Explore (new) funding policies: Financial compensation for engagement of citizens and TSA as eligible costs (probably not feasible anymore)
- Explore new engagement settings: Possibilities of going to the citizens or stakeholders rather than inviting?

Resources:

Chonkova, Blagovesta, Asenova, Desislava; Kozarev, Ventseslav; Bauer, Anja; Bogner, Alexander; Fuchs, Daniela; Hofmaier, Christian; Hampel, Jürgen; Seabra, Susana; Gonçalves, João; Porth, Emily; Timotijević, Lada; Raats, Monique (2017): National Reports – Citizen Panels; Deliverable D4.2 for the EU-project PROSO - Promoting Societal Engagement under the terms of RRI. Link: http://www.proso-project.eu/wp-content/uploads/proso_d4.2_citizen_panels_national_reports.pdf

Kosow, Hannah; Dreyer, Marion; Bauer, Anja; Chonkova, Blagovesta (2016) Methodology Citizen Panels, Deliverable D4.1 for the EU-project PROSO - Promoting Societal Engagement under the terms of RRI. Institut für Technikfolgen-Abschätzung (ITA): Vienna.

Porth, Emily; Timotijević, Lada; Fuchs, Daniela; Hofmaier, Christian; Morrison, Mark (2017): Three reports on barriers and incentives for societal engagement under RRI, one for each

R&I domain. Deliverable 3.2 of the EU-H2020 project PROSO: http://www.proso-project.eu/wp-content/uploads/proso_d3.2_barriers_and_incentives_in_three_ri_domains.pdf

The PROSO Consortium (2018). ENGAGING SOCIETY FOR RESPONSIBLE RESEARCH AND INNOVATION LOWERING BARRIERS – INNOVATING POLICIES AND PRACTICES. A support tool for promoting engagement of citizens and third sector actors in research and in research and innovation policy. Available: http://www.proso-project.eu/wp-content/uploads/proso_d6.2_policy_guide.pdf [Accessed 16.05.2018].

Website: <http://www.proso-project.eu/>

SYNERGENE

Description of the project

SYNERGENE (Responsible Research and Innovation in Synthetic Biology) was a mobilization and mutual learning action plan (MMLAP) funded by the European Commission under the 7th framework programme (2013-2017). The SYNERGENE consortium was coordinated by Karlsruhe Institute of Technology (KIT) and consisted of 27 partners in 16 countries, including research organisations, companies, think-tanks, a network of science centres and museums, an art society, science journalists, a public theatre and activist civil society organisations. The project aimed at contributing to Responsible Research and Innovation (RRI) in synthetic biology by initiating and fostering public dialogue on synthetic biology and mutual learning processes among a wide variety of stakeholders from science, industry, civil society, education, arts and general publics. In the course of the project more than 140 engagement events were held, varying widely in formats, target groups, attendance and duration. The project drew on well-established means of public communication, engagement and dialogue, but also developed innovative formats, in particular at the interfaces of art, science and publics. On this basis, a wide range of learning tools and information materials. In order to enable long-term exchange between different stakeholders, SYNERGENE provided several open fora (for Business, Science, Civil Societies, Policy, Media).

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

In terms of stakeholder engagement, those stakeholder workshops that discussed potential applications for synbio seem to be most relevant for GoNano, for example the two stakeholder workshops on antibiotic resistance and energy, held in the Netherlands in 2016. Here different stakeholder groups discussed the potential of synbio in addressing these societal challenges. The debate became quite concrete (in contrast to many meta-debates in other events). However, the events also illustrated the danger of sliding into a technology fix narrative, when the technology is one-sidedly presented as a remedy for a range of societal problems while more questions concerning the origins of the societal problem, non-technological solutions or the more fundamental ethical concerns regarding the technology are ignored.

The open fora in SYNERGENE might serve as a reference point for the co-creation platform in GoNano. The fora offered opportunities for stakeholder groups to exchange during the project duration and were adopted positively by some groups (Civils Society Forum) but rather ignored by others (for example industry).

Which kinds of stakeholders were involved? At what stage were they involved?

SYNERGENE involved a broad variety of target audiences, ranging from “the public” to particular stakeholder groups, including researchers from different disciplines, students, civil society organisations (particularly ETC Group), Do-It-Yourself- biologists, businesses, policy-makers, science museums, science communicators and arts. Stakeholders were involved in different capacities and degrees: First, stakeholders were involved as participants of single

events. In some cases, stakeholders were also involved in the organization of events, for example the ETCGroup was involved in organizing the SYNENERGENE Forum in Amsterdam in 2016. Second, SYNENERGENE provided the opportunity for CSOs not only to be part of single events, but to be involved in long-term processes and the set-up of the project from the very beginning.

How were the co-creation activities/engagement activities/mutual learning events organised?

Engagement activities were organised by single partners or groups of partners and followed quite different formats from stakeholder workshops, to film festivals, to science café, to theatre events.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

One of the main challenges for the project was that for many stakeholders and citizens synthetic biology was not an issue yet. Early engagement proved to be difficult in terms of recruiting specific stakeholders and raising the interest of citizens but also in regard to the deliberations as such. In many cases the discussions revolved around issues other than synbio (e.g. science in general). In addition, the fact that synbio was new for most citizens often resulted in events that were rather characterized by one-way communication than two-way engagement. In events that focussed on potential applications, the debate became more specific but also often leaned towards a technology fix narrative. The integration of different world views proved to be difficult. Different framings do not only apply to synthetic biology itself, but relate to a variety of issues addressing broader questions of how society should be organized with regard to new technologies and innovation.

SYNENERGENE provided many opportunities for different stakeholder groups to become engaged, also beyond the participation in single events. The project partners explicitly mentioned the benefit of flexible structures of the project and cherished the opportunity to set their own agendas and to design processes according to their needs. This gave CSOs and other actors the opportunity to bring their issues to the table and to reframe the issue of synthetic biology according to their own interests and concerns. This was considered crucial in order to keep different stakeholder groups engaged as a certain alignment of deliberation and the inherent mission of organizations seemed to ensure long-term engagement. The flexible structure of the project allowed for adapting to changing (political or societal) needs for deliberation throughout the process. Thus, in addition to “traditional” CSOs, further groups of the public became involved in the project by participating in as well as organizing of some events, for example ‘Do-it-yourself’ (DIY) biologists and the biohacker movement.

In terms of citizen engagement, frame reflection exercises / workshops might be inspiring examples for GoNano. Online engagement with the general public however has proven to be very difficult.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

On the basis of the experiences with SYNENERGENE we propose four design and process principles for future engagement processes that allow making engagement activities more interactive and engaging (Bauer,Bogner,Torgersen 2016):

Avoid meta-debates; make the discussion concrete and relevant: Organizers of societal engagement events should actively counteract the tendency to meta-debates in the preparation and during the course of the events, for example by discussing specific aspects or topics of the emerging technology (such as a specific area of application) rather than tackling the technology as such. In public engagement events, strategies are necessary to bring participants' own experiences to bear and to arrive at personal statements.

Make use of the variety of framings and encourage frame reflection: The agenda-setting is a crucial element in the organization of public engagement events. Organizers of public engagement events should be aware of the variety of frames in which emerging technologies are debated and take into account respective dynamics for the debate. Organizers should make use of the variety and address different framings to induce a multi-faceted debate. By confronting participants actively with different framings of a technology, a reflection of the participants on their own positions and underlying views can be encouraged.

Transform informational input into two-way communication: When it comes to the ideal of "mutual learning", the type, form and extent of informational input given to the participants are highly relevant. Many events are still implicitly driven by deficit model and therefore provide lengthy expert inputs. To avoid the risk of a top-down enforced debate, organizers could re-think the provision of informational input in more interactive ways. Instead of assuming in advance which information is needed by the participants and preparing respective expert inputs, the participants could be invited earlier in the event to utter their informational needs. An example on how to organize this two-way interaction is the "expert speed-dating" format. Participants have the opportunity to talk to experts in small groups (lowering inhibitions) and to pose their own questions to the experts.

Avoid overly academic debates, encourage creativity and emotions: When debates are led in a predominantly academic way, important attitudes that base on emotions rather than rational reasoning may be missed. Organizers can encourage emotions and creativity in several ways: By clearly signalling that everybody is invited to join the discussion and that emotions and non-academic arguments are welcomed as well, by using innovative tools such as vignettes presenting moral dilemmas or by using genres of imaginations such as theatre performances or films.

Resources:

Bauer, Anja; Bogner, Alexander; Torgersen, Helge (2016) Capturing the Public Imagination: Input to SYNENERGENE Agendas. Deliverable 2.8: Third report for the EU-FP7 project SYNENERGENE.

Porth, Emily; Timotijević, Lada; Fuchs, Daniela; Hofmaier, Christian; Morrison, Mark (2017): Three reports on barriers and incentives for societal engagement under RRI, one for each

R&I domain. Deliverable 3.2 of the EU-H2020 project PROSO: http://www.proso-project.eu/wp-content/uploads/proso_d3.2_barriers_and_incentives_in_three_ri_domains.pdf

<https://www.synenergene.eu/>

FoTTRIS

Description of the project

FoTTRIS (Fostering a Transition towards Responsible Research and Innovation Systems) develop and introduces a new governance practice to foster RRI policy and methods in R&I systems. FoTTRIS stresses that RRI is a collaborative activity of the very early stage of the process (prefix “co” to the acronym RRI. It focuses on the global challenges and on local opportunities for solving them. FoTTRIS performs a transition experiment – an experiment to support transformation of the actual research and innovation strategies into “CORRI” strategies. It designs, tests and validates the operation, organisation and funding of small organisation units – CORRI Competence cells. A competence cell operates as a local one-step innovation platform aiming at encouraging various local actors (stakeholders) to co-design, co-perform and co-monitor co-RRI-projects to be accustomed to the local performance of the global sustainable challenges.

FoTTRIS experiments (so-called transition experiments) the implementation of new governance practices in five different countries. They constitute the basis for FoTTRIS policy recommendations towards EU and member states policy-makers so as to enforce co-RRI into the national and EU R&I systems.

More info at <http://fotrris-h2020.eu/>

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

On the basis of (co-)RRI concept, FoTTRIS project developed a (state-gate) methodology for ensuring a standardised and responsible answer to global challenges through proper operation of groups of stakeholders (so-called transition arenas) interested in co-solving a global challenge. The co-RRI platform (a web-based collaborative platform) serves as a tool allowing the transition arenas work together, following the stage-gate methodology.

The platform thus fulfils several functions, utilities and services to support the co-RRI cells. To start with, it fulfils some innovation services. A well-structured process consisting of various phases and supported by appropriate tools and methods, which guide the participation of innovation actors through the process of co-designing RRI project concepts. The process, consisting of both virtual/online phases and real life workshops, will support knowledge actors

to gradually design, together with other stakeholders, a co-RRI project concept. The platform will also provide tools for checking the compliances to co-RRI principles along the process.

First of all, the existence of the platform and the way it functions within the FoTTRIS project provides useful hints for GoNano project as it successfully fulfils several functions for various types of stakeholders. Secondly, GoNano project would also involve a strong involvement of stakeholders, not only within the platform, but also in various F2F interactions (interviews, workshops). The training and support materials will be made available publicly on the FoTTRIS website only at the end of the project (01/2018).

Which kinds of stakeholders were involved? At what stage were they involved?

Various kinds of stakeholders were involved throughout the project; in general their selection was based on a quadruple helix principle. Representatives of business sector, Scientific Officers, and R&I and public administrations were included in the transition arenas. Also interviews with the experts (actors from academia, civil society, policy, business sector, and even culture and arts) at the beginning of the project helped complement the information gained out of the literature review / desk research and to shorten time-consuming data gathering.

How were the co-creation activities/engagement activities/mutual learning events organised?

A Transition Experiment was made up of a series of workshops to test FoTTRIS' conceptual and methodological frameworks for co-RRI. In each of the 5 countries, in which these experiments has taken place, a competence cell (comprising FoTTRIS' partners) invited local actors from the quadruple helix (Demand side perspective) to design collaboratively a research project using the FoTTRIS frameworks. Each transition experiment works on a different topic. After the frameworks are validated, others will have the possibility to use them in their R&I activities. The sequence of the activities was the following:

- Country launch of the TRANSITION EXPERIMENT workshop
- Country 2nd workshop of the TRANSITION EXPERIMENT
- Country OUTREACH/VALIDATION workshop

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Opportunities and challenges:

- Building a common ground of understanding the idea of the projects with all actors engaged
- Planning and prioritising activities with all actors engaged
- Dealing with conflict interests of the actors engaged
- Making decisions transparent throughout the process for anybody concerned
- Achieving a clear understanding of the final results for everybody involved

- Keeping people motivated to participate throughout the project etc.

Useful insights for GoNano:

For GoNano project, the methodology of involving various stakeholders into the co-RRI process, combining virtual and physical events, is of an important value added. The lessons learnt and experience in this process within FoTRRIS project can feed into GoNano so that co-creation processes with involvement of stakeholders are more efficient. In this respect, the review of co-RRI literature and case studies and general methodological concept is [available online](#).

The issue of involving stakeholders into co-RRI processes was extensively discussed. The discussions had the following conclusions:

- Co-operation between different disciplines and with societal actors beyond R&I community was highly appreciated as a core element of co-RRI; for some experts it represented even a precondition;
- A positive correlation exists between the relevance of co-operations for a particular research field and the extent of willingness or R&I actors to engage in co-operations;
- Close co-operations with non-research actors should not put the R&I community's autonomy and independency at risk.

From the methodological point of view, GoNano can be inspired from e.g. backcasting method used in one of the participatory workshops in order to define necessary actions to reach the desired state in the future. As stated above, the project's training and support materials will be made available publicly on the FoTRRIS website only at the end of the project (01/2018).

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

- 1) We recommend putting emphasis on providing detailed guidelines making the co-creation process running smoothly in every respective step of the project. This includes tips and tricks for recruiting various stakeholders to reflect the country diversity, types of expertise etc.
- 2) It is also advisable to apply the demand side perspective when creating a methodological concept for stakeholders' engagement, rather than approach based on expected technological progress in the given fields of nanotechnology. This would strengthen the responsiveness to societal needs within GoNano project.

ATBEST

Description of the project

The project ATBEST (Advanced Technologies for Biogas Efficiency, Sustainability and Transport) is a collaboration between eight partners located in the UK, Ireland, Germany and Sweden. It is a multidisciplinary collaboration between internationally-renowned research teams and industrial partners, each with complimentary expertise in a wide range of environmental technologies. The ATBEST Marie-Curie ITNs (Innovative Training Networks) will develop new and innovative technologies for the biogas sector to enable Europe to implement its Energy 2020 strategy. The ATBEST ITN will deliver innovative research and industry-relevant training to 14 young researchers in biogas production and utilisation.

Project objectives: Deliver industry-relevant training to 14 researchers

- Deliver innovative technologies within biogas industry in Europe
- Optimise energy delivery along the biogas supply chain
- Establish long-term collaborations between the participating partners

Which activity in this project was most relevant for GoNano? Could you describe why?

However, the ATBEST project was oriented on the research and new technologies development for the biogas sector (4 technical work-packages), the Training activities of the project could be considered as relevant for GoNano.

The ATBEST fellows attended 3 summer schools over the course of the project. Each summer school had a specific technical focus, and incorporated talks and site visits of industrial relevance. The summer schools included training in transferrable business skills.

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Potential biogas uses were evaluated according to their energy efficiency and sustainability criteria. Significant variation might exist in the options to exploit these uses. Partners have worked with each other, biogas industry associations, policy makers and regulators to devise the most appropriate options.

Private Sector role: More efficient use of the energy and greater options in energy storage, biogas companies were of particular relevance to private sector associated partners DMT, GREEN, WIS, BWE and B9OEL. BGE investigated commercial possibilities for enabling greater biogas production in Ireland and distribution via the existing gas network.

The ATBEST ITN combined the expertise of internationally esteemed multidiscipline research teams into a highly integrated network. Each of the partners has a distinct research focus and technological expertise that has been combined effectively in previous collaborations. As a consequence they are highly co-ordinated and well informed about each other's scientific and training activities. The project has been designed such that each of the four technical work-packages brings together host partners with the most relevant complementary expertise to meet the defined sustainability challenges. Specific areas of synergy and complementarity have been identified.

Each ATBEST partner has state of the art research and training facilities to support their chosen area of expertise. These resources will be made available to all ATBEST fellows through secondments and technical visits, to enhance the training and interdisciplinary skills.

Which kinds of stakeholders were involved? At what stage were they involved?

The project focused on the collaboration between internationally –renowned research teams and industrial partners from the very beginning of the project. Each technical work –package included Synergies and Collaboration task providing an assessment and utilisation. Significant variation might exist in the options to exploit these uses. Partners have worked with each other, biogas industry associations, policy makers and regulators to devise the most appropriate options. The ATBEST project provided a wide range of dissemination activities fostering face-to-face events addressing a broader network of actors.

How were the co-creation activities/engagement activities/mutual learning events organised?

The ATBEST consortium - supervisors and fellows - participated in ATBEST network meetings every 6 months at one of the partner sites. The fellows delivered updates on their research and received feedback and guidance from the academic and industry representatives present.

The ATBEST fellows attended 3 summer schools over the course of the project. Each summer school had a specific technical focus, and incorporated talks and site visits of industrial relevance. The summer schools included training in transferrable business skills.

The ATBEST conference was held in Linköping Sweden in September 2016. Nearly 100 delegates, gathered from academia, industry and government were in attendance at the two day event.

The ATBEST team disseminated research results through attendance and conferences and meetings, and by publishing articles in scientific and trade journals, as well as tradition media outlets such as newspapers.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

From our point of view the ATBEST events cannot be considered as a pure “co-creation” meetings or events. There are mostly aiming at presentation of the research progress in respective technical work-packages.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Some of the ATBEST training activities, such as summer schools remain as a good example for the GoNano project in including a complementary training part (business, PR skills etc.) on the summer schools agenda.

RRI Tools

Description of the project

RRI-Tools (www.rri-tools.eu) is a project that has been set up in order to empower actors to contribute their share to the Responsible Research and Innovation initiative. The final outcome of RRI Tools is to develop a set of digital resources and tools to advocate, train, disseminate and implement RRI under Horizon 2020. The objectives of the projects are as follows:

- To raise awareness on Responsible Research and Innovation among all societal actors
- Producing a responsible Research and Innovation Training and Dissemination Toolkit that addresses various components of Responsible Research and innovation
- Ensuring the toolkit is coproduced with and used by the societal actors in the maximum EU 27 Members States as well as Associated Countries
- Building a community of practice that will assure the use, evolution and enrichment of the toolkit

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The following activities were identified as being the most relevant for GoNano project as they are of a similar nature:

1. Establishment of the RRI Tools Collaborative Platform, derived from the project website. This platform serves as a mutual learning environment, providing various RRI tools as well as exchange of experience.
2. Continuous involvement of a diverse range of stakeholders in the project, enhancing the mutual learning aspect during the project. The stakeholders provide a necessary feedback and input to consequent project outcomes and results.

Which kinds of stakeholders were involved? At what stage were they involved?

How were the co-creation activities/engagement activities/mutual learning events organised?

The target groups of actors/stakeholders addressed by the project are the following:

- Policymakers (including funding agencies, regulators, and executive);
- Business/industry representatives (in-house or outsourced innovation departments and/or some R&I base);
- Civil society organisations (CSOs, including foundations, associations, social movements, community-based organisations, charities, the media);
- Researchers and innovators (affiliated with various institutions and organisations on different levels);
- Education community (both formal and informal, from Ministry to school level).

All groups were involved in the project continuously. At first, workshops with the stakeholders were held in order to map the RRI environment as well as needs, challenges, obstacles and barriers from the perspective of each stakeholder group. Stakeholders were also involved in development and design of the RRI Tools Collaborative Platform; the perceptions of stakeholders were translated into needs, and those needs have been translated into a list of

ranked functionalities. Consequently, this list was grounded as a development plan for the platform.

Besides the physical meetings or events, the feedback from stakeholders was collected also by feedback questionnaires at meetings, events and workshops as well as Pop-up questionnaires / Tools assessment questionnaires.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The information on the ways to effectively organize stakeholder workshops and related challenges is not available. As to the outcomes, a series of stakeholder workshops revealed the perception and attitude of each stakeholder group towards RRI and the steps that can be taken to help progress the agenda ([here](#)).

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

- Incorporation of a diverse spectrum of stakeholders/relevant actors by including also e.g. charities or media, or secondary schools
- Involvement of stakeholders in the design and development of the on-line platform, based on their needs and expectations
- The identification of benefits, barriers and obstacles as regards RRI from a viewpoint of various stakeholder group can serve as an evidence-based input to GoNano.
- GoNano project can draw upon the resource repository of RRI Tools and utilize those in order to (i) foster interactions with stakeholders in the project, (ii) provide RRI tools for summer schools

ENGAGE2020

Description of the project

The project ENGAGE 2020-(Engaging Society in Horizon 2020) aimed to increase the practical use of participative and engagement methods among a broader network of the actors, e.g. researchers, policy makers etc. The project also mapped how the public, stakeholders, consumers and other groups of actors are engaged into the research process. The Engage2020 project highlighted the engagement activities relating to the Grand Challenges identified by the European Commission as key issues of the European research and innovation. More info is to be found at <http://engage2020.eu>.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The project identified opportunities for societal engagement for the coming years, mapped and explored existing policies and methods, tools and instruments for the engagement, organised conferences and workshops and opened discussions on the practical method approaches improvement, inspired new actors with the societal engagement into research and innovation agenda, created an online tool on relevant engagement approaches (Action Catalogue), inspired future development focusing on the engagement process in the field of R&I among policy makers and practitioners.

With respect to the above mentioned description activities from the WP5 “Societal Challenges Action” seem to be relevant for the GoNano project. 6 workshops were organized, involving experts, stakeholders and policy makers specialised in the respective Grand Challenges topic area. Following up to outcomes from the workshops and results of the Call for examples (more than 200 respondents – Survey on societal engagement) the Action Catalogue was developed serving as an online decision support tool. It enabled researchers, policy-makers and other groups of actors to find the best suited method for their society engagement project.

Which kinds of stakeholders were involved? At what stage were they involved?

The project mapped a process of workshops and webinars trends, explored consequences and developed ideas for future practice. The consortium worked closely with a range of experts who have enriched conversations. The experts were involved from the beginning of the process of the mapping. Researchers, experts from academia, policy-makers and NGOs provided expert insights on the relevant issues concerning the Grand Challenges. The consortium identified six types of participants for the project purposes included: CSOs, citizens, affected populations, consumers, employees, users and others.

How were the co-creation activities/engagement activities/mutual learning events organised?

The methodology involved 2 expert workshops and 2 webinars. Prior to the first workshop the Engage2020 consortium gathered trends and current developments. These were further developed into a short presentation on current trends around societal engagement which were tested in the first workshop. The development process was iterative, with each activity building on, and commenting on the preceding results. Workshop 1 focused thematically on the Future methods (distributed deliberation, citizen science, user led innovation, culture change. Participants at the Workshop 2 discussed the Future of Engagement (deliberative engagement,

digital engagement, participative research, user led innovation). Webinar 1 focused on the Deliberative engagement and Webinar 2 on the Future of citizen science, science shops and other forms of participatory research. Each of the events attended more than 20 participants, the Webinar 2 more than 70 participants.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

The important statements learned reading the Engage2020 project results are that engagement methods cannot be seen isolated from other activities throughout the project. A major issue with all kinds of citizen consultations is that the participants don't know what will happen with the results of the meetings, how the produced reports/recommendations will be used. When people invest time and efforts they want to know what impact they will have. The clear communication with the participants is needed from the start. The organisers have to communicate what can the participants expect from the process. CSOs and other public actors, users are not always prepared to participate in policy formation activities. This is why training and other incentives are needed to establish competences and support for public actors to get involved in policy making process. Training is an important element in ensuring collaboration between scientists and civil society in R&I activities. An intensive training and constructive communication between these two groups are crucial. In order to create stimulating environment for public engagement in R&I activities, proper infrastructure and incentives should be in place as top-down initiatives of policy-makers or common efforts between research organizations and CSOs to promote public engagement in R&I.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

From the methodological point of view, the GoNano project could be inspired by consulting the online Action Catalogue including 57 different methods on 32 specific criteria. It could serve as a practical tool supporting the selection of the appropriate method portfolio suitable for the GoNano purpose.

Big concern in Engage2020 was given to the issue of involvement of civil society organizations and public actors. Especially users or affected persons are not always prepared to participate in policy formation activities. They might be able to take actions on the local and regional level, but the political culture is totally different on the national and European levels. This is why training and other incentives, e.g. prizes, competitions, rewards, events etc., are needed to establish competences and support for public actors to get involved in policy making process. This is also what GoNano can focus on – to assert the involvement of public actors in co-creation processes by raising capacities of public actors to be able to fully contribute.

This issue is connected with the more general issue of involvement and motivation of different stakeholders. The lessons learnt in Engage2020 show that in order to raise motivation of the various stakeholder groups, raising their level of awareness of project activities and expected results is crucial. The ideal way is – for each stakeholder group – to formulate an added value that would stem from their involvement.

MARINA

Description of the project

The MARINA project (*Marine Knowledge Sharing Platform for Federating Responsible Research and Innovation Communities*) aiming at fostering the RRI approaches in the marine research. The main objectives: 1) new innovation address societal needs, values 2) the research process becomes transparent for everyone 3) research results are accessible for everyone 4) gender and ethical issues are appropriately taken into account in all phases of the research process 5) the education system better responds to the requested profile of future researchers and innovators.

The RRI approach used with all stakeholders (business, industry, policy makers, societal actors, citizens, researchers)in 8 strategic marine Hot Topics issues involving all the Horizon2020 societal challenges:

- Marine biotech
- Sea Transportation
- Deep sea mining (including bio prospecting)
- Marine Change caused by climate
- Renewable energy (wave, wind, tidal)
- Tourism and coastal cities
- Fishing and aquaculture

MARINA project implemented several activities in order to reach all its objectives. general audience.

More info on <http://www.marinaproject.eu/>

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The MARINA project helps to engage a variety of actors in the maritime RRI process through: Mobilisation and Mutual Learning workshops

MARINA travelling exhibition

Guidelines and good practice for RRI

MARINA Knowledge Sharing Platform (most relevant for GoNano)

In order to facilitate the cooperation of everyone involved in marine issues and the effective integration of the citizens' ideas, this online platform collects and organize all existing networks, communities and other platforms on marine issues; it engages researchers, organizations from civil society, citizens, decision makers and stakeholders from industry, easing also their participation to other project activities (such as the MML workshops); it represents a useful tool where everybody can produce and share information, documents, pictures and other resources and it can collect the whole material produced during the project.

On the MARINA Knowledge Sharing Platform are available the specific executive summaries and reports of all workshops demonstrating the necessity of public engagement in the maritime issues, the value of involving society in the STI agenda.

Which kinds of stakeholders were involved? At what stage were they involved?

The aim of the MARINA project is a public engagement, where all stakeholders (business, industry, policy makers, societal actors, citizens, researchers, academia) come together to share their opinions, concerns, knowledge and visions for their communities at the very start of the process.

How were the co-creation activities/engagement activities/mutual learning events organised?

The project is aiming at fostering and trialling a public engagement /co-creation/ process through a series of face-to face workshops (17) focussing on local maritime agenda and 4 international workshops. Mutual learning providing through Knowledge Sharing Platform – a virtual meeting place for sharing knowledge, ideas and opinions relating to the maritime agenda.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Some lessons –learned remarks collected during the process mentioned by the project participants are as follows. Open dialogue shifts a private agenda of stakeholders towards a common vision and societal needs. Citizens are actively participating, providing concrete examples of issue .

A more open-minded approach from institutions from collaboration with diverse stakeholders in other sector is necessary to guarantee sustainable long-term solutions. Creating a common vision and concrete measurable actions among stakeholders is possible to achieve in a very short time providing value for society, the environment and the well-being.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

To collect and analyse best practices and lesson learned for mobilizing citizens and other actors.

To create a common vision and awareness on RRI approach in the nanotechnology area.

To facilitate social learning and reach a common understanding of needs and expectations for nanotechnologies and RRI governance.

NANOBIOWAT

Description of the project

The project aims to establish the Center NANOBIOWAT (*Environmentally friendly nanotechnologies and biotechnologies in water and soil treatment*) combining capacity of three academic and six industrial entities for purpose of development and implementation of environmentally friendly nanotechnologies and biotechnologies applicable to purification and treatment of a wide range of water including groundwater, drinking, waste and surface water, with possibility of removal of organic, inorganic and microbial contamination. The strategic objective of the project was that the Czech Republic became the European leader in purification and treatment of water and soil.

Which are the main activities of the project?

The main activities of the project included development of technologies and pilot production in the field of reductive technologies, oxidative technologies, biotechnologies, nano/bio modified filters and membranes, combined technologies, analytical methods.

Which kinds of stakeholders were involved?

The project was funded by the Technology Agency of the Czech Republic programme fostering the long term cooperation in RDI between public and private sectors. The project involved stakeholders from academia and industry.

What were the opportunities and challenges of bringing various stakeholders together in this activity?

The project focuses on technical research and development in the field of the water purification and treatment and aim to establish Centre of competence combining the capacity of public research organisations and private companies.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

There is no specific recommendation for GoNano regarding methodology.

NANOPINION

Description of the project

Nanopinion (Monitoring public opinion on Nanotechnology in Europe) aimed at monitoring public opinion on what we expect from innovation with nanotechnologies. In order to carry out this study, different modes of public participation are being organised. The project is aimed at citizens with a special focus on hard-to-reach target groups, i.e. people who do not actively show interest in science.

Which activity in this project was most relevant for GoNano?

The project promotes social debate through project website, social media, 4 media channels (The Guardian, Le Courier, El Mundo, TiConUno). The Nanopinion organised outreach events aimed at citizens and a wide range of the educational programmes for the teachers and students from the secondary schools.

Which kinds of stakeholders were involved?

The project targeted citizens, namely the lay people without showing interest on science and technology. Project tools and methodology has been designed to attract people and to learn their opinion on nanotechnology and to enhance education on this field.

The project findings and recommendations has been reported to policy makers from different institutions including the European Commission.

How were the co-creation activities/engagement activities/mutual learning events organised?

The events are taking place in 30 different cities in 21 countries and targeting people who do not have first-hand knowledge of nanotechnologies, but who on the other hand may be nanotechnology consumers without knowing it. All these events, together with the NanOpinion questionnaire, are aimed at monitoring citizens' opinions on nanotechnologies. There are four different formats of events: Streetlabs, Mobile nanOpinion Stations, Workshops, Live events

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Within the NanOpinion project, a repository of information and education content was developed and collated for the platform. The repository consisted of more than 150 items that included the best educational and outreach material generated in previous projects focused on nanotechnology, with a special attention to materials produced in previous FP6&7 and OECD projects. The repository included citations for fundamental knowledge on nanotechnologies and their applications.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Nanopinion project undertook a multichannel activity on public engagement in nanotechnologies . The project used an innovative outreach approach, focusing on dialogue, to monitor Europeans' opinions on nanotechnologies across Europe. It included surveys, social media, discussions, street labs, events in public places. The platform is working in all national languages of the countries involved.

MEDETOX

Description of the project

The MEDETOX project (*Innovative Methods of Monitoring of Diesel Engine Exhaust Toxicity in Real Urban Traffic*) aimed to demonstrate innovative methods of monitoring toxicity of diesel engine exhaust emissions during real urban driving, with a detailed focus on the situation on the ring road of Prague. The results should be used for the improvement of the EU legislation relevant for the vehicle emission regulation.

Which activity in this project was most relevant for GoNano?

Multiple dissemination activities are reported and documented on the project website www.medetox.cz. However, the public presentations seem to be relevant for GoNano activities.

1. Publications in peer-reviewed journals
2. Public presentations
3. Presentations at scientific conferences of international importance
4. Summary publications in a national peer-reviewed journal *Ochrana ovzduši* (Environment Air Protection) and in a national popular magazine *Respekt*
5. Presentation at national conferences, workshops, meetings
6. Public presentations at citizen group meetings and interactions with citizen groups interested in the issue of the effects of motor vehicles on human health
7. Internet articles
8. Educational activities

Which kinds of stakeholders were involved?

The project focused on a multidisciplinary approach targeting stakeholders from the different fields (academia, researchers from the technical fields and medicine, policy makers).

Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement

Technical and methodological solution of the problem of the potential health risk of engine exhaust was the main objective of the project. The project highlighted results' and findings' dissemination and promotion through a variety of the events with potential consumers.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

The GoNano could be inspired by the multidisciplinary approach and including potential consumers into dissemination activities.

SEEING NANO

Description of the project

The Seeing Nano Project aimed at creating novel visualisation tools for enhanced nanotechnology awareness to provide the public with the ability to ‘see at the nanoscale’, and to create an understanding and awareness of the breadth of nanotechnologies, as well as the uncertainties and potential risks connected to them. Seeing Nano was a coordination and Support Action funded by the Horizon 2020 Framework Programme of the European Union

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Seeing Nano followed a coordinated collaborative approach conducted by leading experts in the relevant fields: target audiences were scrutinised by the consortium’s socio-economic sciences and humanities experts, who – in collaboration with the state-of-the-art information and visualisation partners – elaborated and agreed on the most appropriate toolset. The scientific and technical content was provided by experts from the nanotechnology research community in collaboration with experts from risk-communication and nano toxicology.

It appears to be more of a public education project than a mutual learning project, so its potential relevance for GoNano probably is limited to its being an example of communication with citizens/lay people.

Which kinds of stakeholders were involved? At what stage were they involved?

There do not seem to be any stakeholder involvement in Seeing Nano, at least this is not highlighted in the material that is easily present on the net. Rather it seems as if the “stakeholder component” was contained in the consortium; Nanotechnology Industries Association, Bundesinstitut für Risikobewertung (BfR), Ecsite, PlayGen Ltd, Studio-HB, Tomato Ltd, University of Leeds, Zentrum für Soziale Innovation (ZSI), De Proeffabriek (DPF)

How were the co-creation activities/engagement activities/mutual learning events organised?

The focus was on education and learning. [Seeing Nano novel visualisation tools were employed for instance as](#) downloadable the mobile apps that had been produced as part of the project. One could test the app that helped exploring everyday objects at the nanoscale using augmented reality. One could also play an online version of the memory game, with apps available in Czech, Italian, Portuguese, Slovenian and Spanish.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Probably not relevant. The quality of the visual material and the gadgets/props/apps might be an ideal for other projects, however

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

NANOCAP

Description of the project

The NanoCap-project “Nanotechnology Capacity Building NGOs” was financed by FP6 Science and Society, answering to the call FP6-2005-SCIENCE-AND-SOCIETY-14³³. IVAM UVA BV in the Netherlands was the lead partner, and involved 5 environmental NGOs, 5 Trade Unions and 5 Universities. The project ran from September 2006 – August 2009, and had a project budget just over 1.3 million Euro. NanoCap aimed to deepen the understanding of environmental, occupational health and safety risks and ethical aspects of nanotechnology by organising a structured discussion between environmental non-governmental organisations (NGOs), trade unions, academic researchers and other stakeholders. The aim was to develop balanced position statements on nanotechnologies, and giving them the opportunity to formulate their positions within their actual policy context supported by scientific input, to inform their members and the general public and to discuss the issues. One outcome of the NANOCAP project has been several “position papers” of the NGOs involved. Each NGO compiled a paper in its native language and in English.

At the closing conference Peteris Zilgalvis (Head of Unit. Ethics and Science. European Commission) said that the NanoCap project provides an example of creating tools to discuss the acceptability of technology. In his opinion a reliable assessment and balance of product benefits against product safety is absolutely crucial.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

At the onset of the project all partners drafted a action plan. This included what they saw as their relevant stakeholders, their interests in nanotechnology and how to facilitate an active exchange of ideas with these stakeholders. This is somewhat similar to what we aim to do in Task 1.3 to liaison with what each partners considers central stakeholders and change agents, but it appears as more structured in the NanoCap project..

The project has contributed to the public nanodialogue via discussions with members, authorities, industry and the public.

The scientific partner iNano at the University in Aarhus, produced 6 background documents on different applications of nanotechnology:

- Nanotechnology – A brief introduction
- Energy (Part 1 and Part 2)
- Environment
- Medicine (Part1 and part 2)

The background documents all included visions of potential applications. The aim of these documents was to provide updated, concise yet accurate information about nanotechnology in fields of high societal impact like environment, energy and medicine based on scientific literature and authoritative reports. These documents may be used as inspiration in GoNano

³³ The website www.nanocap.eu is unfortunately no longer operational.

both for information material to the citizens, as well as in the selection of applications that are to be deliberated over. However, all the CSOs that were involved in the project had a background in chemical risk policy, and were supposed to have a good understanding as this, that may be somewhat reflected in these background papers.

In addition did one of the academic partners assemble as “nanoethics portfolio” that was made of a number of different factsheets that cover different aspects of nanoethics, sorted in four different categories: Basic ethical concepts, concepts as tools, case studies and regulatory issues. Although quite a lot has happened in the field since the project, not least that the RRI-concept has been coined and received broad adoption with several national and European research funders and institutions. Although this could be somewhat out of the scope of the GoNano project, would such an overview of questions of what is at stake be a useful exercise ahead of the interactive sessions.

Which kinds of stakeholders were involved? At what stage were they involved?
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The model chosen for capacity building was a process of mutual learning between universities and the CSOs involved in the project. The universities assisted the CSOs with scientific information that they would use to develop their positions, whereas the CSOs assisted the universities in developing tools for ‘responsible nanotechnology’.

NanoCap operated through focussed working conferences, position discussions and workplace visits.

NanoCap enabled Civil Society Organisations to elaborate on views on nanotechnologies and thus to contribute to an informed public debate; its results can feed into ongoing multi-stakeholder dialogues. It is an early example of a more deliberative approach of RTD (Research and Technology Development) policy.

How were the co-creation activities/engagement activities/mutual learning events organised?

To develop the CSOs positions on nanotechnology, a deliberative process was set up consisting of separate meeting of NGO and trade union partners, and discussions with the complete project consortium: Eight project team meeting and 5 project conferences.

In the project team meetings several separate trade union and NGO meetings, and five subsequent one-and half-day working conferences the strategies, nanotechnological issues, scientific certainties and uncertainties, the operationalization of the precautionary principle, and priorities for the positioning in the debate on nanotechnologies were discussed.

The universities, with contributions of external experts, organized the project conferences. The program for these different working conferences was mostly determined by the preceding deliberations in the project team. The different university offered different perspectives on the topic (scientific basis, toxicology, environmental issues, sustainability and regulatory issues, ethical issues)

The consortium also arranged visits to companies that manufactured nanomaterials. These were also opportunities for discussions with the management of the companies on issues like the safe design, production, and use of nanomaterials and nanoproducts.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

The exercises had a rather clear and concise goal: Assisting the involved CSOs to develop “position papers” on nanotechnologies. This meant that it was a rather tangible goal with the project, and that the CSOs had a stake in the process and an own interest that something would come out of it.

The project had a clear focus on engineered nanomaterials and products, and specific topics: exposures in the work place and environmental threats. Although GoNano may not necessarily choose these subjects, is it important to have rather specific foci and topics. That will often result in a structured debate with clearer outputs.

Transparency which has become a central theme in RRI-debate, was also present in the debate in this project. The CSOs was clear in their demands for transparency on the use of nanoparticles in consumer products, which was maybe more pertinent at the time. But there is still an urgent need to keep the issue of transparency at all levels in the debate on nanotechnologies.

The clear aim in the development of positions was that the resulting positions should be transparent, critical and well-considered.

It was emphasised from the start of the NanoCap-project that there were no obligations for the participating partners to reach a single, common position on nanotechnologies. All partners should be allowed to leave the project with their own individual position on the subject.

Over the course of the project several methodologies were used to monitor how and to what extent the participants’ options developed. This was used as an input in the further course of the project: What was missing and what needs to be addressed. Although such a fully-fledged assessment might be somewhat over the top for GoNano, it is a good idea to take some time half-way to the project and assess if the project is developing in the direction we would like it to do. But, it should definitely be included in the co-creation activities: What are the expectations at the start, and what are the assessments at the end of the activities.

The final conference of the NanoCap was organised in cooperation with a European Parliament body (STOA – Science and Technology Options Assessment³⁴), this probably also facilitated the

³⁴ The European Parliament's Science and Technology Options Assessment (STOA) is currently chaired by Paul Rübzig.

presence of several representatives from the European Parliament. This can be beneficial for dissemination of the findings of GoNano to policy makers.

CIPAST

Description of the project

The ‘Citizen Participation in Science and Technology’ (CIPAST) was a three-year EU funded project initiated in April 2005. The project was coordinated by the Cité des sciences et de l’industrie. The main aim of the project was to structure and expand a European network of actors concerned with participatory methods in science and technology. To meet this aim, the project firstly identified reference persons, institutions and experts concerned with participatory processes in science and technology, and created a database consisting of more than 3000 contacts. The database worked as a tool for disseminating relevant ongoing and earlier participatory activities in Europe, fostering debate and partnerships and for sharing experiences within participatory processes in science and technology. Subsequently, two training workshops were organized. The workshops involved a wide range of actors with either interest or expertise in public participation. The aim of the workshops was to identify best practices and guidelines for citizen and stakeholder engagement in science and technology. On the basis of lesson learn from the workshops, a training toolkit intended for organisers of participatory sessions/workshops was developed. The training toolkit was the last outcome of CIPAST and consists of comprehensive guidelines, methods and tools for participatory training workshops.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The CIPAST database worked as a tool for creating a network of relevant European actors engaged or interested in participatory activities. The database was used to create the “CIPAST News and Discussion Group” that worked as a platform for dissemination of news and information about participatory activities in science and technology around Europe and for building partnerships. Besides, the database was used to create a “Pool of Experts”. The Pool of Experts consisted of a list of 100 persons with expertise in participatory methods in science and technology. As a part of the CIPAST database³⁵, the Pool of experts was made publicly available as a resource to support the use participatory methods in projects about Science and Technology. (Unfortunately, the database is currently not accessible). As a part of the database, a digital newsletter about participatory projects in Europe was initiated. Regarding GoNano, the CIPAST database and digital newsletter provide inspiration on how to establish a community of change agent for RRI within nanotechnology.

³⁵ <http://www.cipast.org/cipast.php?section=13>

The CIPAST Training toolkit ‘CIPAST in Practice’³⁶ is based on the experiences from the CIPAST workshops. The toolkit is available online and contains the following sections:

- *Introduction*: Gives a contextualisation of public participation in science and technology and introduces the CIPAST project and the training toolkit.
- *Design*: Introduces some principles behind public participation, provide information on how to choose the right participatory method and achieve impact, and on how to evaluate a participatory event.
- *Practice*: Presents ‘The Case Study Training Methodology’ based on the best practices developed and tested in CIPAST. The section provides five case-studies that are prepared to applying in a participatory event. In the case-studies, the participants have to act as practitioners and deal with challenges of designing a participatory event.
- *What else?:* Provide more case-studies, presents the poster methodology used in the CIPAST workshops and additional information on how to arrange a participatory workshop in science and technology.

‘CIPAST in Practice’ exemplify how to communicate experiences in participatory processes and can be relevant GoNano, both regarding the design of the co-creation workshops and regarding the communication and dissemination of participatory methods.

Which kinds of stakeholders were involved? At what stage were they involved?

CIPAST involved a diverse range of actors concerned by participatory methods and procedures. The consortium consisted of:

- Two parliamentary Technology Assessment Institutions
- Four science museums and science centres
- Two national research organisations
- Four academic teams involved in research policy
-

During the first year of the program, more than 3000 contacts on actors was collected (see the section above). During respectively the second year and the third year, the first and the second training workshop was prepared and held. The two workshops involved around 140 participants both from European and non-European countries. The participant represented universities, research centres, Science Museums, NGO’s, governmental agencies and think tanks.

³⁶ The CIPAST Training Toolkit can be found at the link:
http://www.cipast.org/download/CD%20CIPAST%20in%20Practice/cipast/en/intro_1.htm

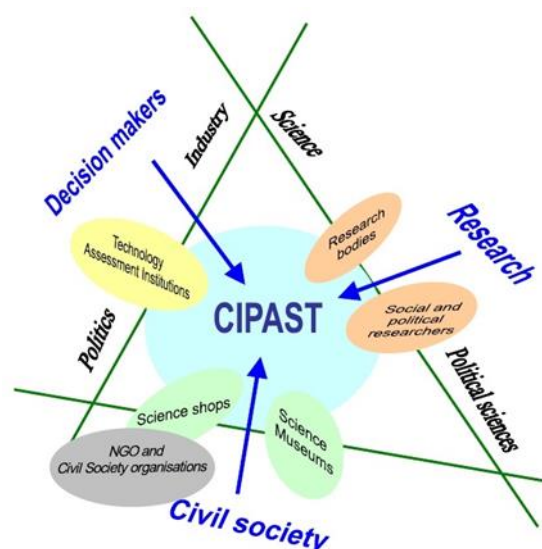


Figure from the “Publishable Finale Activity Report & Final Recommendations” from CIPAST.

How were the co-creation activities/engagement activities/mutual learning events organised?

The creation of the CIPAST database, News and Discussion Group and digital newsletter had the objective of fostering mutual learning and knowledge sharing about participatory methodology in science and technology.

During the two CIPAST workshops, the participants were presented for different participatory methods and exercises. On the basis of the experience from the first workshop and an analysis of evaluation questionnaires filled out by the participant, best practices was identified and applied in the second workshop. The analysis of questionnaires filled out by the participant was done again as the evaluation of second workshop. On the basis of the evaluations and the experiences in the workshops, the CIPAST training toolkit was developed.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

An essential recommendation based on the lessons learn from the workshop, is that participants should be actively involved in training activities by engaging them in problem-oriented exercises based on real life cases. A good idea is to ask participant for relevant case-studies in advance of the workshop. Active participation may also be achieved by e.g. making poster session with debates on subjects chosen by the participants. The aim of engaging participant actively in participatory activities is to strengthen practical understanding of how to design a participatory workshop.

In addition, it is recommended to draw on a diverse range of cases from several different kinds of stakeholders. The aim of this is to train participants to navigate in diverse situations.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Based on our analysis it is recommended to engage participants actively during the participatory exercises. In particular, the use of problem-solving exercises based on real life cases is recommended to support active participation. In addition, the CIPAST database and digital newsletter can be used as inspiration on how to build a community of change agent for RRI in nanotechnology. Finally, the training toolkit provides valuable guidelines and inspirations on how to facilitate participatory processes. This might be useful in the development of methodology and organization of the GoNano workshops.

CALIBRATE

Description of the project

The ongoing caLIBRAte project (Performance testing, calibration and implementation of a next generation system-of-systems Risk Governance Framework for nanomaterials) (42 months project started in 2016) founded by Horizon 2020 aims to establish a versatile next-generation nano-risk governance framework for assessment and management of human and environmental risks of nanomaterials (NM) and nano-enabled products. The framework is a web-based “system-of-systems” linking different models and methods for:

1. screening of apparent and perceived risks and trends in nanotechnology,
2. control banding, qualitative and fully integrated predictive quantitative risk assessment operational at different information levels,
3. safety-by-design and multi-criteria decision support methods,
4. risk surveillance, -management and -guidance documents.

The framework will be founded on thoroughly tested models and stakeholder needs. The goal is that the quality and trust in the caLIBRAte nano-risk governance framework models will exceed current level of most existing REACH compliance tools.

Which activity in this project was most relevant for GoNano? Could you describe why? Please elaborate on the mutual learning/engagement/stakeholder involvement objectives

The project focuses on model revision, calibration and demonstration of existing models and methods that support the risk governance framework in regards to safe innovation and already implemented nanomaterials. They argue that developing and having access to reliable, tailored and up-to-date tools for evaluation and prioritization of the risks posed by production, use and disposal of nanomaterials, in a context that might imply high uncertainty, is essential for anyone involved in taking decisions on these technologies, particularly in the business and insurance sectors. I argue that the multi-stakeholder dialogue amongst actors involved and influenced by

these risks is the most relevant part of the project for GoNano. The reason is that the overarching scope of these dialogues is to ensure future responsive and responsible innovation risk governance of nanomaterials and nano-enabled products, which is highly relevant for the GoNano project.

The aims of the multi-stakeholder dialogue are to

- Discuss stakeholders' needs, priorities and views on managing risks in the innovation, launch, and post marketing monitoring process
- Present state of the art achievements on nano-risk governance, basing on the aims of the caLIBRAte
- Contribute to define the criteria and function of the future caLIBRAte Systems of Systems risk governance framework

Which kinds of stakeholders were involved? At what stage were they involved?

The project wants to consult and “sell” to four groups of stakeholders

- R&D and industry (safety at work)
- “Regulators” (“Administration”)
- Insurance (risk transfer)
- Consumers and NGO's (safe application)
-

More detailed, the stakeholder groups are research, industry, regulatory bodies, insurance, consumers, workers and other civil society organizations, other organization involved in R&D, production, marketing, use, inspection, insurance, communication and decision-making on nanomaterials and nano-related products.

caLIBRAte has involved the stakeholders in a first step clarifying the opinions and needs for risk governance amongst stakeholders including industry, regulators, the public and the insurance sector. Stakeholders will be involved for defining the user requirements of the framework and will receive training in the framework at the end. The stakeholders are also consulted in all work-packages related to model-development to ensure alignment of the nano-risk governance framework and linked models with user needs.

How were the co-creation activities/engagement activities/mutual learning events organised?

To clarify the options and needs for risk governance among stakeholders, there has been undertaken interviews/survey with responses from industry, research, policy makers, insurers, regulators and citizens. The project also organised workshops.

To adjust the models to user needs based on input from stakeholder, the input will be obtained from a workshop focusing in particular on the potential (key users from industry, insurance, regulation and consumer organizations and NGOs).

The developed Nano-Risk Governance framework SoS, is envisaged to be recognized and accepted by the multidisciplinary stakeholders participating in the decision making process for Nanotechnology related risks.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano?

The project states that a multi-stakeholder dialogue will build trust and ensure responsive and responsible innovation risk governance of nanomaterials and nano-enabled products. The opportunities of bringing stakeholders together was engaging stakeholders in a dialogue of needs, priorities and views on managing risks in the innovation, launch, and post marketing monitoring process. Moreover, the stakeholders had the chance to gain knowledge on the state of the art achievements on models and tools for risk management, and to contribute to the development of future risk governance integrated systems.

At this point, there is little information on the challenges of bringing stakeholders together at the project's webpage.

One useful insight for GoNano is that the project indicates that current guidance and regulations linked to nano are not sufficient, and identified unregulated areas, including end of life products.

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration

When evaluating one of the stakeholder workshops, the project stated that the workshop served as an effective platform to discuss stakeholders' risk perception and needs on managing risk, and to present state of the art achievements on nano-risk governance. Moreover, the workshop served as an effective platform to explore the SUN software-based Decision Support System (SUNDS) as one of the elements of the future caLIBRAte System of Systems risk governance framework for nanotechnologies. On basis if this, I recommend that a stakeholder workshop could be a great platform to foster responsiveness to societal needs, learning and collaboration.

Resources:

http://cordis.europa.eu/project/rcn/203256_en.html

<http://www.nanocalibrate.eu/home>

OBSERVATORYNANO

Description of the project

OBSERVATORYNANO project: http://cordis.europa.eu/result/rcn/196583_en.html (April 2008 till March 2012) stands for an European observatory for science-based and economic expert analysis of nanotechnologies, cognisant of barriers and risks, to engage with relevant stakeholders regarding benefits and opportunities. The corresponding EU-website of the project is not available anymore.

The ObservatoryNANO project addressed opportunities, challenges and risks of nanotechnology by assessing all aspects of the value chain from basic research to market applications in terms of scientific, technological and socio-economic developments. Ethical, legal and societal aspects (ELSA); potential environment, health and safety (EHS) issues; and developments in regulations and standards were evaluated, and as far as possible integrated with the science and technology (ST) and economic analysis. The project objectives were:

- To support policy makers by providing validated information on the current and forecasted state of nanotechnology developments in ten key technology sectors.
- To engage with experts to discuss and review scientific and technical developments, and relate these to socio-economic impacts and wider issues.
- To consolidate this analysis in an online database of concise reports, which clearly identify developments, opportunities, challenges, and risks.
- To provide information and tools for the scientific and business communities to support the responsible development of nanotechnologies

The project employed a combination of literature review, patents and peer-reviewed publication analysis, and extensive expert engagement. The project provided an analysis of ten broad technology sectors and the target audience, policymakers, were informed via annual factsheets, and briefings. In annual reports the ethical and societal impact of nanotechnology developments were given. In addition, opinion leaders were interviewed on different aspects, such as individual and collective responsibility; nanobiomedical ethics; ICT; and communication between scientists, technology, and society. The consortium developed a toolkit to allow scientists to consider the larger societal and ethical implications of their research, and tools for business to support corporate social responsibility (CSR), including a NanoMeter.

The NanoMeter was an online tool allowing businesses to assess their products and services in terms of EHS and societal aspects, and offering suggestions for improvement. EHS aspects were largely integrated within the briefings and factsheets. A detailed review of the implications in each sector and the landscape for EHS research in Europe was given in separate reports. Furthermore an annual report described changes in hard and soft regulation, and standards, within Europe, internationally, and in selected third countries.

The long-term goal of the project was to provide a framework for the establishment of a permanent European Observatory on Nanotechnologies. To this end the structure and purpose of similar initiatives was reviewed, and an advisory board of international experts and policy makers was established to assist in the elaboration of various models. However, at the end of the project, no immediate follow-up was given on the outcomes of the project and knowledge was lost (personal communication Malsch, 18 January 2018). In 2017, a follow-up project, called European Union Observatory for Nanomaterials (EUON; <https://euon.echa.europa.eu/is>) was

started by the European Chemical Agency (ECHA), but it is not clear yet (in 2018) whether there will be new calls for projects and how EUON will be shaped exactly.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

Most relevant activities for GoNano were the online **Toolkit**, since this toolkit guided scientists to consider the larger societal and ethical implications of their research and offered suggestions for improvement, and a **tool** for business to support corporate social responsibility (CSR) including a so-called **updated NanoMeter**, which provided hands-on support for businesses. The Toolkit aimed to 'provide the reader with means to frame her own vision of the debate and to sharpen ethical awareness of the parties involved in the development of nanosciences and nanotechnologies' via descriptions of ethical dilemmas. However, the websites of the Toolkit and the Nanometer are not available anymore.

In addition, via various means the project aimed to engage various stakeholders and create awareness and provide information, e.g. via interviews, workshops, surveys, and peer-review of project output, dissemination, engagement with the wider community, annual conferences. For example, opinion leaders were interviewed on individual and collective responsibility, nanobiomedical ethics, ICT, and communication between scientists, technology and society. These activities were basic participatory methods, however, mostly they related mainly to **informing** (and not necessarily engaging) groups of stakeholders.

Following feedback from policymakers, the project team delivered **factsheets and briefings**. These annual factsheets summarised key developments and took into account wider aspects of science and technology and economic developments. The briefings reviewed key developments in terms of added value of nanotechnology, European impact, ELSA and EHS aspects, as well as regulatory aspects. Factsheets and briefings can have a direct relevant influence, and should therefore always be included when engaging policy makers. No information has been found on what effects these briefings have had.

Which kinds of stakeholders were involved? At what stage were they involved?

Main stakeholders involved:

European decision-makers in governments, industry, and finance with which the project sought to objectively assess the implications of evolving nanoscience and nanotechnology developments on their plans and programmes.

In addition, the project interacted with stakeholders including scientists, industry, business, NGOs, and policymakers.

The reports do not indicate in which stages they were involved. These focus on the technology or the societal and ethical aspects themselves, not on the organisational aspects.

How were the co-creation activities/engagement activities/mutual learning events organised?

The main instruments for organising the engagement activities were the **toolkit** and the **NanoMeter** (see above). The precise working, however, cannot be determined anymore. The reports do not describe methodological topics.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?

Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

How to precisely organise co-creation meetings is not addressed in the reports. The reports do also not address procedural requirements.

The key lesson from the report is that promoting responsible Research and Innovation (RRI), using multistakeholder approaches and addressing EHS, ELSA and regulatory issues should take place throughout the entire lifecycle of products.

Another recommendation would be that it is important that projects are followed up. The gap between the new observatory project (EUON) which is starting up in 2018 and the end of the OBSERVATORYNANO in 2012 caused loss of relevant knowledge (personal communication).

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

The project is an early example of applying a methodology in which knowledge about societal aspects was gathered and where tools were developed to enhance responsible innovation. Unfortunately, the Toolkit and online NanoMeter are not available anymore. The final report from the project and the report about the Toolkit do not provide organisational information.

An outcome is that multi-stakeholder approaches which address EHS and ELSI issues can foster trust building and confidence amongst stakeholders and can help with the management of most controversial issues. Follow-up of results must be ensured.

From personal communication it became clear that it was a good project but immediate follow-up on such a project is needed so that key information doesn't get lost. Only recently, in 2017, ECHA started with setting up a follow-up Observatory (EUON) which was announced by the EU in 2016. It can be concluded that the outcomes of such projects should be implemented by policy makers in the right places, and resources should be made available for governance (personal communication, Malsch, 2018).

Lessons learned from using an online survey in the project: the complexity of the surveys hindered the number of respondents. Therefore these data could not be used.

A note on the ObservatoryNano project is that info from the project is difficult to access. Many documents are not available anymore. Personal communication provided more insights.

NUCLEUS

Description of the project

NUCLEUS project: <http://www.nucleus-project.eu/> (H2020, No 664932). runs from 2015-2019 and stands for New Understanding of Communication, Learning and Engagement in Universities and Scientific Institutions. NUCLEUS is investigating how to make Responsible Research and Innovation (RRI) a reality in universities and research institutions. What institutional barriers prevent these organisations from engaging with their stakeholders to align research with society's needs? How can these obstacles be overcome? NUCLEUS will implement new policies and programming in 30 international test sites to understand the DNA of RRI. The project started in 2015 and is now halfway. The first phase has been completed. From November 2017 the second phase starts and ten universities or research institutes will establish so-called *Nuclei* to stimulate RRI in practice and learn from these practices. In addition, twenty other single activities will be organised as well by other stakeholders in order to learn from these practices as well.

The final goals for the project are to collect a set of practical recommendations for leaders of research institutions on how to implement RRI, developed with an understanding of academic culture and tested in academic environments (RRI Guidelines) and to embed RRI in the governance and culture of academic institutions in Europe, China, South Africa and Georgia.

Which activity in this project was most relevant for GoNano? Could you describe why?

Please elaborate on the mutual learning/engagement/stakeholder involvement objectives.

The second phase of the project will be most relevant for GoNano. Unfortunately, this phase starts from November 2017. Recommendations on how to bring RRI into practice from the first phase can be relevant. These are the following:

- Take into account cultural differences when bringing RRI into practice
- Collect and use the local knowledge about initiatives of practicing RRI
- Support individual researchers in various ways
- Recognise and facilitate role models
- Train researchers to engage with the public and in science communication
- Use incentives to embed RRI in universities and research institutes
- Create and facilitate platforms to exchange knowledge and best practices on science communication and engagement

Note: At most institutions already something is happening which is – in practice – RRI, but is not necessarily labelled as such. An example is the University of Twente where the DesignLab tries to foster relationships between researchers and society, e.g. between local decision-makers, industry, artists. For example via the S2D4S-workshops (Science to Design for Society).

Which kinds of stakeholders were involved? At what stage were they involved?

Main stakeholders involved are researchers and their research institutes. In the projects, so-called *cells* represent various other stakeholder groups with which universities and their researchers have and develop relationships. The six cells represent the following groups of stakeholders: 1) Universities and scientific institutions: higher education institutions as well as

research institutions; 2) Public policy: e.g. national, regional governments and local municipalities. At various policy levels: European, national, regional, local and institutional; 3) Civil society: non-governmental organisations and initiatives in the field of research and innovation, such as science and technology advocacy groups or citizen sciences initiatives; 4) Media: media and journalists covering science, technology, research and innovation, includes associations of science journalists; 5) Public engagement: institutions and initiatives that organise public engagement, such as science festivals or science cafés; 6) Economy: science and technology companies as well as other organisations and institutions involved in technological innovation driven economic growth, such as technology transfer agencies and chambers of commerce.

Stages of engagement are planned both in the first phase of the project (from 2015-2017) as well as in the second phase of the project (2017-2019 – in the future).

How were the co-creation activities/engagement activities/mutual learning events organised?

Participation or engagement mechanisms used in NUCLEUS in the first phase?

6 Field trips explored relationships with the 6 groups of stakeholders; interviews and case studies were conducted

NOTE: in the first phase of the project no co-creation activities were organised.

NOTE AD: what level of engagement / participation are these? Shall we relate this to the levels of participation as described in the Ladder of participation by Sherry Arnstein?

Participation or engagement mechanisms proposed in NUCLEUS for the second phase?

Vary, but not defined or prescribed yet. Key mechanism in the second part of the project is 'Building a NUCLEUS community' at each of the ten institutions. This translates in 'building relationships at various levels' by means of building Communities of Practice at each institution that foster collaboration between stakeholders which will work on two practical cases. The cases be shaped with help of co-creation processes. The co-creation processes will vary for each context or situation, and have to be established yet. However, each institute is free to choose how they organise the co-creation processes. The Implementation Roadmap provides guidelines on how to develop the two cases. At least will include: focus groups with various stakeholders, one-to-one meetings, interviews. At local institutions also other methods such as Science2Design4Society workshops.

What were the opportunities and challenges of bringing various stakeholders together in this activity? Does the project provide useful insights for GoNano with respect to the following:

- How to organise productive co-creation meetings?
- The procedural requirements for successful stakeholder involvement?
- Inspiring outcomes?
- Good practices?
- Insights into what drives mutual learning among stakeholders and how multi-stakeholder engagement processes can be optimised for learning and for responsiveness to societal needs?

Productive co-creation meetings:

- Listen to the needs and wishes of the participants. What is in it for them?

Procedural requirements:

- Not described

Inspiring outcomes:

- Not yet available

Good practices

- Not yet available

No specific guidelines for setting up a co-creation process are given.

Insights in drivers of mutual learning, optimal learning from and responsiveness to societal needs

- Not yet available

On the basis of your own analysis, please provide recommendations for GoNano regarding methodological requirements for a multi-actor methodology optimised to foster responsiveness to societal needs, learning and collaboration.

Multi-actor methodology should be applied and be flexible to the local needs and circumstances.
Can take place in very different and varying ways with different levels of engagement.

APPENDIX 4: INTERVIEW INSTRUMENT

INTERVIEW GUIDELINE FOR GROUP 1 INTERVIEWS (EXPERIENCES, GOOD PRACTICES)

Aim of interviews (info only for partners):

- To gather information regarding experience with methodologies for co-creation with social actors, with a particular emphasis on nano and mutual learning projects
- To gain insights regarding the effectiveness of such methodologies, pros and cons, good practices

Target actors: RRI experts, co-creation practitioners, risk communication experts, societal engagement experts (see as examples contacts already identified in the interview tracking list, prepared based on inputs from all partners).

Interview guideline:

GoNano interview about your experiences with public and stakeholder engagement, co-creation exercises and mutual learning activities that aim to involve society in research and innovation.

First part: your experience with engagement/co-creation/mutual learning initiatives

1. **Which kinds of projects and initiatives have you been involved in, with engagement/co-creation/mutual learning aims?**
(both past and present initiatives; please select the most relevant one(s) in your view)
2. **Which kinds of stakeholders did you involve? Please also indicate the level of expertise and knowledge of the stakeholders involved**
(e.g. lay people/citizens, professional stakeholders, suppliers, customers, researchers, etc.)
3. **What were/are the aims of engaging stakeholders?**
(in particular: what kind of learning outcomes did/do you seek to achieve?)
4. **What kinds of approaches were used, and why were they chosen?**
(in particular: how were different types of stakeholders, particularly citizens and professional stakeholders, brought together? At which stage of the research and innovation process and the project did you/will you engage stakeholders?)
5. **Did the engagement/co-creation/mutual learning activities provide any kind of benefit?**
(tangible or intangible advantages/benefits to the project/initiative and its results)
6. **Did you monitor/measure the impact of these activities? How?**

Second part: Your suggestions and recommendations on engagement/co-creation/mutual learning initiatives

1. **Which processes/methods/activities do you think are most useful?**

Are there any recommendations you could offer?

(regarding how multi-stakeholder engagement processes might be optimised for learning and responsiveness to societal needs)

If you were to run the project/initiative again, would you change anything? Why?

7. Can you recommend any other good practices?
(beyond the initiative we talked about)

Additional question (optional):

- Would you say that gender and/or diversity plays a role in engagement methodologies and/or communication?
- What were the opportunities and challenges of bringing various stakeholders together in processes of mutual learning and co-creation?
- What is your view on stakeholder engagement and co-creation approaches?

APPENDIX 5: GONANO INFORMATION SHEET AND CONSENT FORM



GoNano INFORMATION SHEET

- Workpackage 1 interviews -

What is the GoNano project?

GoNano is a Coordination and Support Action funded by the European Union under the NMBP Programme of Horizon 2020, Grant Agreement n° 768622. It brings together 10 partners from all over Europe with the aim to align future nanotechnologies with societal needs and concerns by enabling co-creation between citizens, researchers, industry, civil society organisations, and policy makers across Europe. The project started in September 2017 and will run for three years. For more information on the project objectives and the consortium, please see <http://gonano-project.eu/>

Aims of the research

GoNano aims to improve the responsiveness of research and innovation processes to public values and concerns. In order to do this, we want to learn lessons regarding mutual learning and public responses to nanotechnology from prior public engagement initiatives. To that end, we are interested in hearing about your experiences with public and stakeholder engagement, co-creation exercises and mutual learning activities that aim to involve society in research and innovation.

This interview will be part of a series of approximately 50 interviews with researchers, industry representatives, experts in communication and social sciences, policy makers, civil society representatives and citizens across Europe, conducted by GoNano project partners between January and March 2018.

What does your participation entail?

The interview will take approximately one hour. During the interview, you will be asked about your ideas and experiences with societal engagement on nanotechnologies.

The interview data will be used as input for the design and planning of the co-creation activities in GoNano. The interview data will be stored securely. The interviews will be anonymized to ensure confidentiality. Access to the primary data will only be granted to individuals directly involved in the analysis of the interviews.

The interview results will be summarized in a public report. The report will present aggregate findings from the interviews; the report may include quotations from interviews, but these quotes will not be attributable to individual respondents. This report will be submitted as a deliverable to the European Commission. It will also be used as input to subsequent GoNano activities, and may be used as the basis for news articles, other reports or a research publication.

You have the right to withdraw at any time without prejudice and without providing a reason. If you have any further questions, or if you would like to withdraw, please contact *[please insert name + contact details of the interviewer here]*.



GoNANO INFORMED CONSENT FORM

- Work package 1 interviews -

I, the undersigned, confirm that I have read and understood the information about the project, as provided in the information sheet. I have been given the opportunity to ask questions about the project and my participation. I voluntarily agree to participate in the project. I am aware that I can withdraw at any time without prejudice and without providing a reason. The procedures regarding confidentiality (e.g. use of names, pseudonyms, anonymization of data, etc.) and the expected use of the data for research, publications, sharing and archiving have been clearly explained to me. I understand that other researchers will have access to this data only if they agree to preserve the confidentiality of the data and if they agree to the terms specified in this form.

Participant:

Name of Participant

Signature

Place

Date

Interviewer:

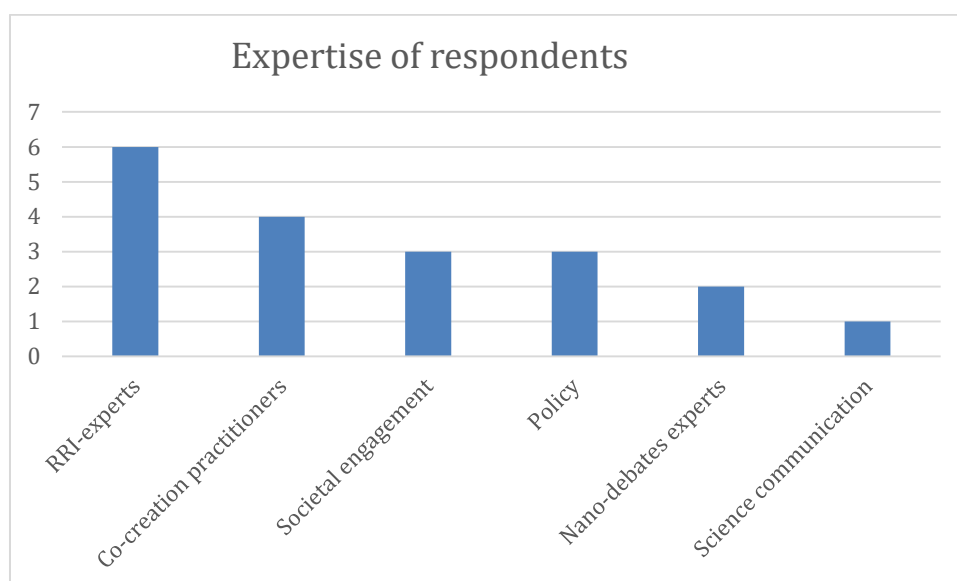
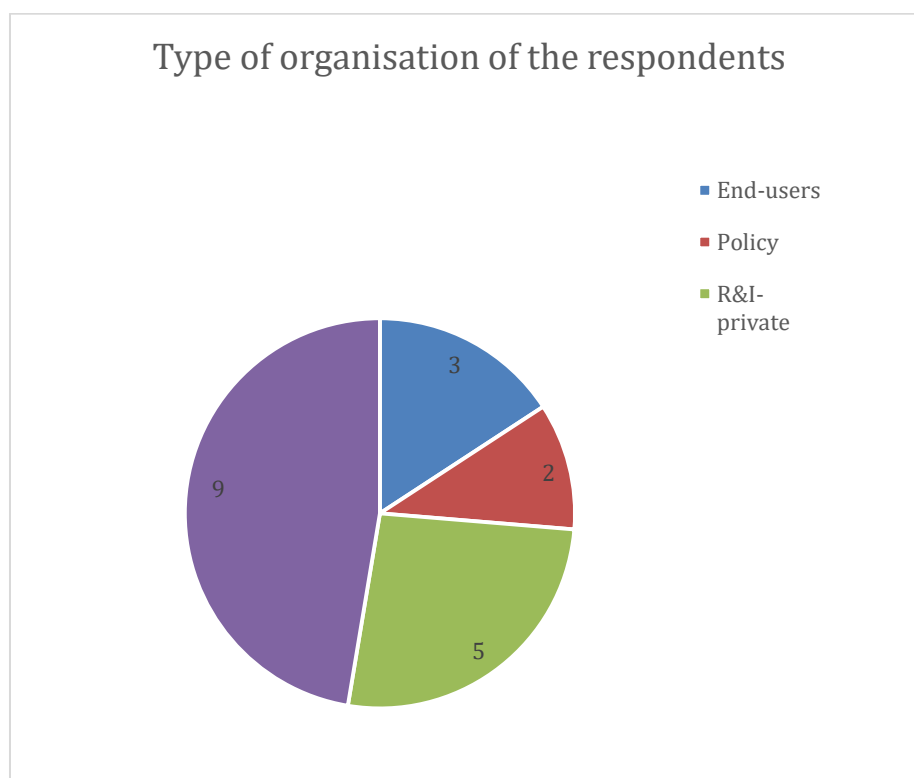
Name of Interviewer

Signature

Place

Date

APPENDIX 6: GENERAL CATEGORISATION OF INTERVIEW RESPONDENTS



- 19 interviews: all completed
- Relevant expertise with respect to mutual learning, co-creation, stakeholder engagement and nanotechnologies
- 10 countries in Europe, in particular pilots countries (AU, BE, DE, FI, FR, IR, IT, NL, NO, UK)
- 11 males and 8 females involved

APPENDIX 7 GONANO INTERVIEW REPORTING

[illegible]

- processes/activities deemed most/least useful
- recommendations regarding optimisation of multi-stakeholder engagement processes for learning and responsiveness to societal needs
- indications of other good practice in the area of engagement/co-creation/mutual learning

[illegible]

(please analyse and/or copy and paste here any additional content from the interview that may be relevant for GoNano)

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APPENDIX 8 NATIONAL DIALOGUE INITIATIVES REPORT TEMPLATE

Question	Description of the requested information
Country	Netherlands
Title national dialogue initiative	Dutch Societal Dialogue on Nanotechnology
When – what period	2009-2011
Short description of the initiative and its objectives	This dialogue exercise was an attempt by the Dutch government to achieve upstream public engagement by opening up its policy-making process to bottom-up input from stakeholders and interested citizens. The dialogue was part of a broad governmental Action Plan on Nanotechnology and was shaped and organised by an independent committee. The goals of the Dutch Societal Dialogue were to inform about nano and to enhance a dialogue on ethical and societal aspects, that is to stimulate a public dialogue about the opportunities and threats of nanotechnology and resulting applications with regard to individuals and society as a whole. Nanoplatform was the project organisation who was organising the national dialogue in practice. In two rounds, a total of 35 projects (21 + 14 projects) were given small grants to organise their various activities. In addition, the Nanoplatform organised some events as well, organised media attentions, and conducted two survey studies to poll respondents' view on nanotechnology.
Organiser? Responsible actor?	The organiser was the platform Nanopodium which stimulated the exchange of thoughts, ideas, opinions and best practices on nanotechnology. The responsible actor was the Committee Societal Dialogue on Nanotechnology. These were different people, representing various organisations and areas of expertise, who were asked to participate in the Committee. The Committee reported back to the minister.
Other actors? Target audiences	Many other actors were involved in the Societal debate. The projects often consisted of a variety of partners collaborating in organising the activities. Each project tried to reach out to various target audiences. An example are five collaborating science cafés who organised science café meetings in each city and targeted at participants of those science cafés as well as other citizens interested in Nano topics via life-stream connections.
What methods and means were used for the initiative? With which aims?	A combination of methods, including various means were used: - <i>Work conference</i>: experts, researchers and NGOs were invited in a face-to-face setting to think about the format and content of the public dialogue on Nano-technology; - <i>Surveys and focus groups</i>: by means of quantitative research (surveys) and qualitative research (focus groups) a baseline study on the knowledge and opinion of the citizens on Nano-technology was taken;

	- <i>Informing</i>: informing citizens (including students), journalists and policy-makers, about different applications of Nano-technology, through brochure about Nano-technology, a website including a fact-check page, educational materials, and short YouTube movies; - <i>Public dialogue</i>: different activities for getting into dialogue with citizens were used such as: theatre performances, TV-shows and documentaries, comics and popular articles, contests, (internet)panel discussions, science cafés, interviews on TV.
What kind of engagement or participation activities were involved?	- Work conference = engaging Various actor groups were invited to actively shape the agenda for the national dialogue initiative. - Surveys and focus groups = consulting Based on the baseline study, information was retrieved about the knowledge, needs and concerns of citizens with regard to Nanotechnology. - Informing = informing By using a variety of means citizens were informed about Nanotechnology and its application (areas). Also, a goal was to create awareness about Nanotechnology among the citizens with these means. - Public dialogue = informing, consulting, and engaging The level of engagement that was aimed for with the public dialogue was primarily engaging. However, the Committee aimed for an informed dialogue, so citizens were informed and consulted as well. (In the evaluation of the initiative it became clear that citizens were mostly informed, and less engaged). - Informing: website, brochures, fact-check pages, educational materials, YouTube movies, theatre performances, TV-shows, documentaries, comics, popular articles - Consulting: surveys, focus groups, contests, interviews on TV - Engaging: work conference, (internet)panel discussions, science cafés
Were co-creation processes included? If yes, what outcomes were identified?	Some activities seemed to be forms of co-creation: - The work conference is a form of co-creation, however within the professional sphere. Citizens were not included in this process; - Panel discussions, contests and science cafés, can be seen as an indirect form of co-creation, in which citizens were invited to shape the policy agenda on Nanotechnology. However, the results of their input were not directly clear.
Outcomes of the initiative in general	Based on the evaluation of Krabbenborg (2012), the following outcomes can be detected: - Dutch citizens have increased their knowledge on Nano-technology with ten percent between 2009 and 2010. - Furthermore, Dutch citizens identified opportunities for Nano-consumer products, and risks for Nano in cosmetics and food. Also, Dutch citizens thought transparency of information is more important than precaution. - While the knowledge of Dutch citizens has increased, the Nanopodium did not succeed in a dialogue on 'broader ethical and

	societal aspects' of Nano-technology. Which was one of the aims of the government when founding the committee.
<i>Recommendations for GoNano</i>	Useful elements for GoNano are: baseline study among citizens, focus groups, (internet)panel discussion, fact check-page on website, science cafés: - Krabbenborg (2012) was positive about the baseline study, as it was very useful to evaluate the national initiative. This measurement is especially helpful for the citizen consultation of GoNano to get insights in the knowledge of the target audience. - Furthermore, we could also have a pre-test/formative evaluation on the proposed methodology by means of a focus group with members of the target audience. In this way we can anticipate on potential errors; - The fact check-page on the website is a useful mean to also apply in GoNano, as it helps to stimulate an 'informed dialogue'. During the national initiative this fact-check pages was often visited by citizens, but also by journalists and NGOs (Nanopodium, 2010). Even though the knowledge on nanotechnology might have been improved since 2010, there are still a lot of misconceptions and uncertainties with regard to Nano-technology among the citizens. By means of a fact-check page information can be easily structured in a general part and among the three areas on which GoNano will focus on. - Internet panel discussion can be a useful tool for GoNano as it allows a much larger number of people, than the 50 that will participate in the citizen consultation, to participate in the debate on Nano-technology. However, we should guide the online debates and be careful with the amount of freedom the participants get in the panel discussion, as the debate might go beyond the objectives of GoNano. This was also the case with the national initiative where the goal of an ethical discussion on nanotechnology was not met (Krabbenborg, 2010). - Science cafés can be useful format for the citizens consultation of GoNano as they offer space for deliberation, and encourage an open dialogue between citizens and stakeholders to express opinions and attitudes. Science cafes do not aim to influence policy making. Anne Dijkstra (2016) found in her study about Dutch Science Cafes on Nanotechnology that both speakers and participants considered the possibility to discuss issues on nanotechnology important. From the national dialogue initiative we can learn that in GoNano the focus should be much more on actively engaging stakeholders, than just informing them. Furthermore, we should be directing the engagement carefully, as we do not want to lose sight of the goals of GoNano.
References to the initiative	Krabbenborg, L. (2012). The potential of national public engagement exercises: Evaluating the case of the recent Dutch societal dialogue on nanotechnology. <i>Australian Journal of Emerging Technologies and Society</i> , 10(1), 27-44.

	Commissie Maatschappelijke Dialoog Nanotechnologie. (2010). <i>Tussenrapportage Nanopodium</i>. The Hague. Dijkstra, A. M., & Critchley, C. R. (2016). Nanotechnology in Dutch science cafés: Public risk perceptions contextualised. <i>Public Understanding of Science</i>, 25(1), 71-87. doi:10.1177/0963662514528080 Nanopodium. (2010). <i>Het giga van nano. Rapport 1-meting van de publieke opinie over nanotechnologie</i>. The Hague.
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APPENDIX 9 NATIONAL DIALOGUE INITIATIVES REPORTS

NORWAY

Question	Description of the requested information
Country	Norway
Title national dialogue initiative	The nanotechnologies are coming: How can we create a living societal dialogue//Nanoteknologiene kommer: Hvordan skape en levende samfunnsdialog?
When – what period	This seminar took place between 12:00 – 17:00 on the 9 th November 2005.
Short description of the initiative and its objectives	It was aiming to discuss and lift reflections on the societal significance/importance of the nanotechnologies. The implications for ethics, the environment, health and value creation. This was a seminar where there were two presentations from the NANOMAT-programme of the Research Council of Norway and one from the leader of the Norwegian Biotechnology Advisory Board. This was followed by an expert panel with representatives from ethics, the environment, health, value creation and the need for societal dialogue. Then followed an idea workshop, presentations of the different viewpoints, and summing up. The aimed to create ideas for a societal dialogue.
Organiser? Responsible actor?	This was arranged by the Polytechnic Association, together with the Research Council of Norway and The Norwegian Board of Technology. The practical organisers where the Polytechnic Association and the seminar took place in their premises. As the minutes of the meeting end with “This debate must continue, not least in the Polytechnic Association”, it may be unclear if the outcomes would /were meant to influence something specific.
Other actors? Target audiences	The Polytechnic Association usually holds public meetings, and there are no indications in the invitation or the minutes that it was not a public event. Judging from the pictures that we can view in the published minutes, it appears to have been a rather mixed audience, but as far as we know is the attendance in these meetings dominated by people with a technical background. It was 40-50 persons attending the seminar, again judging from the pictures.
What methods and means were used for the initiative? With which aims?	So this was a seminar with a somewhat provocative title, probably it was circulated through the web pages, and possibly written material by all 3 organising organisations. It started with two “expert” talks, with representatives from two important organisations. The a panel discussion with a professor in ethics, the leader of Friends of the Earth in Norway, a director of Medicine from GlaxoSmithKline, Norway, an investor and finally the director of the

	Norwegian Board of technology. After this, the attendees were divided into 3 groups for the idea workshop: 1) What are the important themes that should be addressed in a societal debate on nanotechnologies? 2) What groups and what persons. Institutions should be invited to participate in the societal dialogue on nanotechnology, and what do we imagine they can contribute with? 3) How can a societal dialogue on nanotechnologies be organised? So the seminar invited to talks and debates of well-known institutions, as well as group work for those that participated
What kind of engagement or participation activities were involved?	○ Informing – There was definitely an element of this, as nanotechnology was rather novel at this time in Norway, but also offering different perspectives (Ethics, health, the environment, value creation, the need for dialogue for the society) ○ Consulting – the group work with the following presentation for the other had elements of consulting ○ Engaging – from the pictures it appears that the organisers participated in the group work, and there appears to have been extensive deliberations between the members of each group ○ Empowering – it is hard to know to what extent this appeared, but there are on the other side nothing that indicates that there were formal barriers for this, at least in the group work.
Were co-creation processes included? If yes, what outcomes were identified?	As it is not clear what the outcomes of the seminar were to be used for, it appears that all agreed that the Norwegian societal debate on nanotechnologies had not started yet, and all agreed that it should start. Broad sections should be involved: researchers, CSOs and ordinary citizens, this is also important for the government when it is to implement regulations. Terms like many and some are used in the minutes, so it was not necessarily consensus on all points. Co-creation could be to stretch it somewhat, but it appears that the audience was invited to think in broad terms at the start of a new initiative to involve the public.
Outcomes of the initiative in general	As the closing line of the minutes was quite general, it can allude to that no one had responsibility to implement the messages from the audience. However, the intentions appear to be opening up, and there are some interesting points from the group works: using a term like preparedness for the future ('fremtidsberedskap'). It was also consensus on the need for a continuous debate as some of the questions would be nearly impossible to answer once and for all.
Recommendations for GoNano	The set-up of the seminar was inspiring: experts, panel debate and group work. I may not be completely apparent

	how this could be of use to GoNano, but that the audience appear to have had quite refined inputs to a societal debate at that early stage, talk to the point the citizens can have important and valuable insights and reflections even on complex and complicated issues. So it remains important and even valuable to involve citizen-consumers in debate on emerging technologies.
References to the initiative	Minutes of the meeting including pictures (in Norwegian): http://www.polyteknisk.no/old/Referater-videoer/Nanoteknologiene-kommer-Hvordan-skape-en-levende-samfunnsdialog.html Are there papers published or reports available about the initiative? Please give (a few) references including - when available - web links. We will not be able to be complete so it is okay to mention only one or two publications.

Question	Description of the requested information
Country	Norway
Title national dialogue initiative	Research Days/Forskningsdagene
When – what period	The Research Days is an annual national event. In 2007 the Research Council's nanotechnology programme at the time ('NANOMAT'), had a dedicated stand in Oslo.
Short description of the initiative and its objectives	The research days is an annual event where all types of research and knowledge-based institutions are invited to display their activities for the public. The exact content of Research Days are the responsibilities of the local arrangers throughout the country. Up to 200 arrangers are involved. The first event took place in 1995. The aims are to create excitement and understanding for research; communicate the research and what it means in our everyday lives; show the connection between research, innovation and businesses; create interest in the media for research and research outputs; recruitment of students. Here we focus on the Research Days in 2007, where our institute (SIFO) participated over two days, together with three researchers from IFE (Institute for energy technology) on the stand of the NANOMAT programme. Our mission was to show the enactment of nanotechnology. The overall theme of the Research Days that year was 'You are getting warm' ('Tampen brenner').
Organiser? Responsible actor?	Project management and secretariat is with the Research Council of Norway, who also hosts a number of events. They strive to connect the different local events through marketing, visual identity, home page, attracting local and national media. There is a dedicated contact in all Norwegian regions, 18
Other actors? Target audiences	The event is for the public in general: let people in all ages and all knowledge level to get a glimpse in to the world of research.
What methods and means were used for the initiative?	The methods to attract the public to visit the stand is to a large degree up to those that is on the stand. For SIFOs part we dressed up a mannequin doll with nanotechnology based clothes and artefacts. The researcher from IFE had

With which aims?	some instruments, while the Research Council arranged a quiz, and winners were pulled out on regular intervals, who won a small toy car that could run on solar cells. This was to attract the public to visit the stand. Those that visited the stand were free to ask questions and have a small demonstration on nanotechnology. These interactions where a form of dialogue, although the questions and feedback were not collected/documented. The aims included communication of research and research outputs and trying to explain what nanotechnology was and how it represented possibilities, and questions for SIFOs part. So we had the mannequin doll, some extra nanotechnology based products, like iPod Nano which was used to attract attention and highlight that there at the time were a number of products in the stores that where nanotechnology based.
What kind of engagement or participation activities were involved?	○ Informing – giving information to the public in a dialogue based way, although one could imagine since this was such a novel technology at the time, and the researcher may seem like authorities, that not all would dare to ask questions, there were a number of interactions.) ○ Consulting – there were no organised way of consulting with the public, probably most focus on informing, but definitely opening to ask questions ○ Engaging – engagement was a stated aim, but probably not in the strict sense, more of arousing interest ○ Empowering –the non-experts were very welcome and encouraged to take the initiative and come with questions. But there was no dedicate, formal way of collecting the feedback
Were co-creation processes included? If yes, what outcomes were identified?	Are there already co-creation elements included? Could you briefly describe these? What makes it co-creation?
Outcomes of the initiative in general	What were the outcomes of the initiative in general?
Recommendations for GoNano	The Research council concluded that the stand was a success due to many visitors. Standing at street level and make oneself available for the general public can be a labour-intensive and exhaustive affair, but also rewarding. When one interact with the public about something as abstract as nanotechnology, it definitely helped that we had consumer products with nanotechnology on display. This makes the technology more tangible, and opens up possibilities for slightly different conversations on technology. Co-creation was not that explicit at the time, but should have been, and we should have asked for specific feedback from the visitors (the public). What recommendations would you give for GoNano? What can we learn from and what should we take into account (or not) regarding engagement or co-creation? And why?
References to the initiative	The Research Days has dedicated web sites (in Norwegian only): http://www.forskningsdagene.no/ To our knowledge are there no reports about the initiative in 2007. There is a presentation (In Norwegian) on publicity that was created

	(http://arrangor.forskningsdagene.no/c35256/binfil/download.php?tid=45628)
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Question	Description of the requested information
Country	Norway
Title national dialogue initiative	“Nano medicine and human enhancement”, the Norwegian part of an initiative under the NanoDiode project
When – what period	The actual deliberations were held on 2 nd and 16 th of June 2014, but stakeholders were given information/were involved prior to the events, and were reacting to the deliberations after them
Short description of the initiative and its objectives	SIFO wanted to arrange a third generation deliberation (3GDP), and decided to do the deliberation on the themes of nano medicine and human enhancement, HE, based on an expectation that these themes would be of interest both morally, politically, socially and economically in addition to their fascinating technical and medical aspects. Nano medicine was high on research agendas throughout Europe and globally with hopes, hypes and expectations for breakthroughs. Some expected that the issue of nano medicine was so value-laden, that deliberative processes (in particular with ordinary citizen-consumers) would have given very foreseeable results (extreme positive). That made the subjects enticing in themselves. We used nano medicine as an example of (potential) HE. It is no doubt that this was a contested theme as it resonates to something deep inside us. The Norwegian deliberation was a kind of “front runner”, a model for a series of replications, later to be performed in the Netherlands, Germany, France, Austria and Italy (but on different themes).
Organiser? Responsible actor?	SIFO, then The National Institute for Consumer Research, organized the event under the NanoDiode project. SIFO
Other actors? Target audiences	Recruitment was based on SIFOs ideas about which actors or institutions that would be central to future hearings about nano based HE, and preferably stakeholders that had not yet formulated policies and strong opinions on these themes. The event had approximately 10 stakeholders, with some circulation; representatives from the Norwegian Research Council, the Norwegian Church, the Norwegian Humanist Organization, three representatives of the User Committee of the health region (different patients’ groups), the School of Theology at the University of Oslo, the Norwegian School of Sports Medicine and the Faculty of Dentistry at the

	University of Oslo and one representative from the firm Oslo Medtech.
What methods and means were used for the initiative? With which aims?	Stakeholder engagement and dialogue were seen as essential to a responsible development of nanotechnology in Europe. The NanoDiode-project aimed to establish an innovative, coordinated programme for outreach and dialogue in Europe to support an effective governance of nanotechnology. The project combined ‘upstream’ public engagement (in the form of dialogues which integrate societal needs, ideas and expectation into the political debate) with ‘midstream’ engagement and ‘downstream’ strategies for communication, outreach, education and training. The theoretical approach was the “third generation” deliberative processes; the three main characteristics or aims/ambitions with identifying and arranging a 3GDP on nanotechnology were: 1. SIFO wanted to go from general ethical questions into more <i>specific political, social or legislative/regulatory questions</i> on more specific applications/subfields 2. SIFO wanted to address the problems with unmet expectations of participants, by directly or indirectly <i>connecting to political or social processes</i>, and 3. It aimed at designing a process that, if possible, <i>could avoid a plain replication of outcomes</i>. The degree of specificity (1) is clearly higher than in most of the deliberations we analyzed in <i>Consumers and Nanotechnology</i> (Strandbakken et. al eds. 2013). As for unmet expectations and policy impact (2), the institute reflected on and analyzed this dimension. First, there was a degree of policy relevance because the project was funded by the Commission. Further, if we define policy a bit wider than the actions of elected bodies and political parties, there was a real potential for connecting to political processes through influencing the involved NGOs, organizations, research administrators and academics. Such actors might, at different points in time, be asked to respond to, reflect on and make their voice heard in political process. As such, the 3GDP may have more of an indirect connection to political processes, rather than a direct one. As for the problem of plain replication of outcomes, this was highlighted prior to and during the workshops.
What kind of engagement or	○ Informing – the deliberation started with giving

participation activities were involved?	information to the actors in a one-way communication process (pre-prepared materials, lectures, informative videos) ○ Consulting – further, one asked for opinions or views from the participants ○ Engaging – the deliberation turned into a two way process in which information or views are exchanged between various actors, later formulated as a statement from the stakeholders ○ Empowering – deliberations were done as a two way process where stakeholders strongly influence the flow of the event (workshop democracy).
Were co-creation processes included? If yes, what outcomes were identified?	There were perhaps already co-creation elements included in the process, but the language of co-creation was not applied. Co-creation of policies and approaches, not of technologies (in the first place).
Outcomes of the initiative in general	The stakeholders; organizations and institutions were the ones who would be included in future hearings, in state sponsored ad hoc groups etc., meaning that they might play a part in decision making and policy making on a societal level, however indirect. Further, they will be central in all sorts of societal dialogue on these themes. SIFO anticipated both internal dialogues and processes in the stakeholder organizations, and – in a second step – more extrovert activity from them, and we have observed some activity in these directions from some of our participants. SIFO was asked to present the themes in other settings, in addition one patient organization issued a statement on the theme of HE, based on the statement from the event.
Recommendations for GoNano	In order to create stakeholder interest and engagement in the early parts of a co creation event: First, be <i>specific on themes and questions</i> in order to provoke some unexpected responses Be ambitious with the <i>workshop organization</i>, the content of the material and posters, the design of them, quality of presentations, time and space for debates etc. Finally, practice <i>workshop democracy</i>, where participants decides on what themes to highlight and how
References to the initiative	NanoDiode website and reports, book chapter “Third-generation deliberative processes: from consumer research to participatory democracy” (Strandbakken & Borch 2015, in Strandbakken & Gronow eds, 2015).

DENMARK

Question	Description of the requested information
Country	Denmark
Title national dialogue initiative	The Science Theatre: "NANO"
When – what period	2007
Short description of the initiative and its objectives	"NANO" was a science theatre that communicated the pros, cons, opportunities and risks associated with the development of nanotechnology. The aim was to communicate nanotechnology, which is a highly technical subject, in a way that would engage the audience in debate about future opportunities and risks associated with nanotechnology. Thereby the overall aim was to contribute to democratization of the development of nanotechnology. The project was based on the idea that theatre play has the ability to evoke the audiences' emotions, and thereby restrain their attention to the technological subject. "NANO" included • Three theatrical dramatic/scientific scenarios showing the present use and potential future development of nanotechnology. • Three filmed debates with scientists discussing the topic. • Audience debate about nanotechnology based on the played scenarios and the filmed debate.
Organiser? Responsible actor?	The play was produced by Centre for Art and Science (SDU) in collaboration with producer Lars Romann Engel and the Danish Board of Technology Foundation. SDU and Engel were responsible for the production, and The Danish Board of Technology Foundation was responsible for documenting the outcome of "NANO" and to reflect on the used methods.
Other actors? Target audiences	The main target group was the audience. As the event was free, everyone could participate (in total 1150 people participated). Project managers from The Danish Technology Foundation were responsible for a constructive audience debate, and produced a report presenting the insight from the audience debate.
What methods and means were used for the initiative? With which aims?	Theatre was used as a method to build scenarios based on the current development of nanotechnology. This helped to engage the audience in the debate around the highly technical subject by putting their feelings into play. Screened video debate with scientists discussing the risks and opportunities of the future development of nanotechnology created a foundation for a constructive audience debate in touch with reality.

	As a part of the data generation postcards were handed out before the play. The postcards contained questions about the participants' thoughts about nanotechnology. During the debate the participants' answers to the questions were shown on a big screen. The data generated at the event were analysed and published by the Danish Technology Foundation for future use and insight in theatre as a method for citizen engagement in societal questions associated with development of technology.
What kind of engagement or participation activities were involved?	Informing: As the theatre was produced in collaboration with scientists working with nanotechnology, the theatre showed realistic present use and future development of nanotechnology. This was mediated in theatre in order to engage the audience. Engaging: The participants were invited to engage in debate with scientists and other audiences. Informing: Based on the audience debates, an analysis of the audience attitude towards nanotechnology was presented in a report.
Were co-creation processes included? If yes, what outcomes were identified?	The project did not include direct co-creation with citizen, but the audience debate can be understood as an indirect form co-creation, that engages the citizen to take action. Besides this the project produced knowledge about the audiences' attitudes towards nanotechnology, that were later presented to policy makers.
Outcomes of the initiative in general	On the basis of the audience debates during "NANO", DBT made a report, which gave insight into the public understanding and attitude towards nanotechnology. To achieve the best output as possible, the report was sent to the Danish governmental Science Committee, and handed out to the audience. A large amount of the audience stated, that the event had given them a better foundation for taking part in discussions about nanotechnology. The report also pointed out, that the audience saw citizen involvement as an important way of avoiding the public's disgust with politicians. Another important outcome was that the project gave insight into science theatre as a method of engage citizen in the debate about the development of new technologies, and the societal and ethical questions it very often entails. Thereby, "NANO" exemplifies how theatre can be used as a

	method of communicating complex scientific subjects to the publics, and facilitating intelligent and fruitful debates between citizens and scientist.
Recommendations for GoNano	“NANO” contribute with valuable knowledge about science theatre as a way to communicate highly technological subjects in an interesting and engaging ways. In relation to GoNano, the project can be used to exemplify how forms of art, like theatre, have the ability to contribute to citizen engagement and scenario building that evoke emotions and senses, and thereby stimulate conversation. “NANO” can be used as an exemplary case on how to integrate theatrical elements as a method of scenario building in public meetings, citizen consultation and, in particular, debates between scientist and citizens. In general, art as a method of engaging citizens in science debate, has advantages as it evoke emotions, and bring attitudes into play: “A maturing body of work indicates that the arts can deeply engage people by focusing on the affective domain of learning (i.e., engagement, attitude, or emotion) rather than on the cognitive domain (i.e., understanding, comprehension, or application), which is often emphasized in science education” (Lesen, Rogan and Blum, 2016).
References to the initiative	Center for Kunst og Videnskab, Syddansk Universitet (2017). Videnskabsteater “NANO”. Teknologirådet (2007). Rapport over Videnskabsteateret: “NANO”. Publikums holdninger til nanoteknologi. Lesen, A., Rogan, A. and Blum, M. (2016). Science Communication Through Art: Objectives, Challenges, and Outcomes. Trends in Ecology & Evolution, 31(9), pp.657-660.

IRELAND

Question	Description of the requested information
Country	Ireland
Title national dialogue initiative	STRIVE – Nanotechnology: Public Engagement with health, Environmental and Social Issues
When – what period	01.10.2007-31.12.2009
Short description of the initiative and its objectives	The first objective was to map out what can be said about knowledge of nanotechnology in contemporary Ireland. The second objective, and the one that is discussed here, was to pilot a series of nanotechnology communication events, which would provide the basis of a future communications/ consultation strategy for policy-makers.
Organiser? Responsible actor?	The organiser and responsible actor was the School of Communication, Dublin City University, supported by funding from the Irish Environmental Protection Agency.
Other actors? Target audiences	A number of nanotechnology communication events took place as part of the initiative, with a varied target audience: • Second-level students (13-16 years old) • Citizens' juries (community groups) • General public visiting a gallery • Science Café • Focus group with open invitation participants • Informal community groups
What methods and means were used for the initiative? With which aims?	Second-level students (13-16 years old) Method: lessons, debates, and students creating podcasts and/or YouTube media on nanotechnology. 2. Means: face-to-face engagement • Citizens' juries (community groups) Citizens' juries: Method: Citizens' juries are a type of public participation and decision-making process used for community-based issues, and have been used for nanotechnology public engagement in the past. They are designed to allow controversial public issues be discussed among a small sample of people, a 'jury', who listened to experts, or 'witnesses', and then make recommendations based on what they have heard. The participants have a chance to listen, cross-examine and deliberate as a group of jurors. Means: The invited jurors at this event were members of north Dublin community partnership workers, and the event was a face-to-face event. • General public visiting a gallery Method: An exhibition, Your Science Your Say: Nanotechnology (YSYS:N), was designed as a public engagement forum that combined an installation with facilities for YouTube and web forum public response. Videos in the exhibition showed four Nano scientists from different areas who presented the potential

	risks and benefits of their own research and nanotechnology in general. A voting booth was installed for visitors to respond on camera to the researchers and discuss implications. Means: public engagement forum • Science Café Method: The “Café Scientifiques” have increased in popularity across Europe, as has its Irish counterpart, the Alchemist Café, which is generally held in a pub. It consists of a group of Irish science communicators who arrange monthly science talks. An Alchemist Café with a nanotoxicologist was arranged, where the talk was held in a pub followed by a Q&A session as well as a lively discussion. Means: pre-existing group event. • Focus group with open invitation participants Methods: The Irish TV channel RTÉ broadcast a series on science, <i>The Investigators</i>, and screened one episode on Irish nanotechnology. A focus group was organised to capture audience responses to this programme. Means: focus group, with participants who had responded to an ad in the local newspaper and on boards.ie, an online open forum. • Informal community groups Methods: Two focus groups were arranged to focus specifically on groups of people in contexts where nanotechnology would rarely if ever be discussed, and where new concepts of nanotechnology would be incorporated into existing community discourse practices. The groups targeted was a sustainability awareness group in a local Dublin community centre and a Back-to-Work scheme in Dublin. Means: co-facilitated focus groups.
What kind of engagement or participation activities were involved?	The chief mode of participation activities was engaging (a two-way process in which information or views are exchanged between various actors) and empowering (a two way process where the non-experts can take the initiative and come with questions). In most engagements, the participants were asked to submit their responses, thoughts, questions or concerns, and for a number of the events experts were present who were able to engage in discussion and dialogue with the participants.
Were co-creation processes included? If yes, what outcomes were identified?	The outcomes were not specifically co-creation, but rather focused on engagement with the public and citizens in order to inform them and gauge the level of knowledge and information on nanotechnology that exists.
Outcomes of the initiative in general	What were the outcomes of the initiative in general? The outcome of the public engagement events were overall very good, albeit attendance at some of the events, mainly the citizens’ juries and the focus group with open invitation participants, was low. Nevertheless, the events in this project did demonstrate the close connections between academic and new media nodes of discourse on such public engagement activities. What these events say about levels of public engagement needs to be investigated further, and more work is needed to engage the public if the science and science

	communication communities are serious about creating a culture of scientific engagement. The more involved public engagement activities require media presence and momentum for success with added media exposure and public relations, requiring considerable investment not to promote technology but, crucially, to promote dialogue.
Recommendations for GoNano	What recommendations would you give for GoNano? What can we learn from and what should we take into account (or not) regarding engagement or co-creation? And why? The main recommendation I would give based on this Irish national dialogue is that the outcomes show the importance of continuous dialogue and engagement with the public. The existence of nanotechnology alone is not enough to presume an interest in the topic among the general public – rather, the relevant stakeholders need to reach out and work to foster an environment where dialogue and meaningful exchange comes from a place of mutual interest and engagement. This is important to ensure that the debate around nanotechnology is inclusive and represents a broad swathe of the public, and not just specific groups who may have a bias for or against nanotechnology.
References to the initiative	Murphy, P. (2010) Nanotechnology: Public Engagement with Health, Environmental and Social Issues STRIVE Report. Dublin: Environmental Protection Agency and Dublin City University. https://www.epa.ie/pubs/reports/research/health/STRIVE_61_Nano_Murphy_web.pdf

CZECH REPUBLIC

Background information concerning the nano-community relevant to **Medicine, Energy and Food** areas – stakeholders, both companies and RTOs

The Micro & Nanotechnologies in the Czech Republic are represented by universities, research centres, clusters and by increasing number of SME companies. In addition to basic research at universities such as Charles University in Prague, Technical University of Liberec, Palacky University Olomouc, University of West Bohemia in Pilsen, Brno University of Technology, Prague Czech Technical University or University of Chemical Engineering and other, research centres were established. These centres like Central European Institute of Technology, Regional Centre of Advanced Technologies and Materials, Research Centre for Nanosurface Engineering and others, are in close contact with universities and are reinforcing R&D results for transfer into practice. This fact offers a big opportunity to build up a strong link between industry and research sphere.

The essential role in the microtechnology and nanotechnology research is played by individual institutes of the Academy of Science of the Czech Republic.

There are three clusters initiatives in the Micro & Nanotechnologies in the Czech Republic: Czech Nanotechnology Cluster, the medicine–pharmaceutical cluster Nanomedic and the biomedical cluster Nanoprogres. Besides the members of the cluster initiatives in the Czech Republic there are companies like Elmarco, Nanotrade, Advanced Technology Group, Tescan, Advanced Materials-JTJ, Spolsin, and other companies. Even though the Micro & Nanotechnology sector does not have a long tradition in the Czech Republic, there are many competitive universities, research centres and SME companies. The Czech key partners are mainly represented within the automotive, aviation, textile and chemical industries which have a strong tradition and most gain from the use of nanotechnology.

More on Nanotechnologies in the Czech Republic can be found in a CzechInvest brochure [here](#) or in videos here:

<http://www.radio.cz/en/section/marketplace/czech-republic-makes-big-impression-with-nanotechnology>

https://www.youtube.com/watch?v=Uf_XrW1ahro

<https://youtu.be/uJKR5xPPg0c>

CEITEC is a scientific centre in the fields of life sciences, advanced materials and technologies whose aim is to establish itself as a recognized centre for basic as well as applied research. CEITEC offers a state-of-the-art infrastructure and great conditions to employ excellent researchers. CEITEC was approved by the European Commission on 6th June 2011. It is a consortium whose partners include the most prominent universities and research institutes in Brno, and it benefits from the support of the Region of South-Moravia and the City of Brno. The following participate in the setting up of the centre of excellence: Masaryk University, Brno University of Technology, Mendel University in Brno, University of Veterinary and Pharmaceutical Sciences in Brno, Veterinary Research Institute and Institute of Physics of Materials of the Academy of Sciences of the Czech Republic. Multi-field CEITEC is in fact the first type of a scientific centre in the Czech Republic to integrate research and development in the fields of life sciences, advanced materials and technologies in such a large range. The research is

divided into 61 groups and 7 programmes: 1. Advanced Nanotechnologies and Microtechnologies, 2. Advanced Materials, 3. Structural Biology, 4. Genomics and Proteomics of Plant Systems, 5. Molecular Medicine, 6. Brain and Mind Research, 7. Molecular Veterinary Medicine.

1. Nano for medicine

This is perhaps the most developed nano-based sector in the Czech Republic. It is undoubtedly due to the technology of production of nanofibres by electrospinning invented in 2003 at the Technical University Liberec, subsequently commercialized as 'NanoSpider' by the [Elmarco](#) company. The technology is used by many stakeholders mentioned below, besides other, later developed technologies based on different nano-fibre fabrication principles.

[Nanoprogress](#) – cluster of **30+ companies** and 2 RTOs (Technical University Liberec, [Centre for the Development of Engineering Research](#) (VÚTS)) that cover the two GoNano relevant areas mentioned above + textile using nanomaterials

[CzechImplant](#) – cluster of **14 companies** (more than half research-performing) sharing some members with Nanoprogress, and **5 universities**, more active in the field of advanced materials, some of them being nano – based

[Nano Association of the Czech Republic](#) – **19 members** (companies), partly overlapping with the members of Nanoprogress, with considerably wider scope, also active towards the society and targeting at international communication. The goal of the organization is to better represent, both nationally and internationally, the strengths and capabilities of Czech companies in business, research, and education.

[Its project "Czech Is Nano"](#) promotes the outcomes of the research and everyday application of the nanotechnologies organising a range of events (Czech Nano Days) across the Czech Republic and abroad.

Nanopharma – development of body organs by usage of nanofibers, in vitro expansion and cultivation of cells

Contipro – wound healing with hyaluronic acid, pharmaceutical ingredients, implants of peripheral nerves

Student Science – development and testing medicine

Inocure - developing drug delivery and scaffolding systems based on nano/microparticles (μ Sphere technology) and nanofibrous systems (InoMATRIX technology).

IOCB Prague – micro-nano-optofluid systems for the diagnosis and studies of rare cancer cells, diagnosis of neurodegenerative diseases

Optaglio – human textile sensations and tissue engineered nanobiosensors

EXBIO – diagnosis and therapy of chronic inflammatory diseases

VUT Brno – inorganic polymers for 3D print for bone structure repair

Medicine in a broader sense (healthy environment) - [Advanced Materials JTI](#)

Utilizing the photocatalytic properties of TiO₂ nano-crystals in coatings and geopolymeric facing materials to clean air, water and soil, limit the growth of micro-organisms and produce self-cleaning (antimicrobial) surfaces.

Nanospace – allergy prevention

European Technology Platform Nanomedicine – we have communication contacts to the platform through the membership of Technology Centre in the Mirror group of ETPN.

Example of the high-level event organized:

High-Level Symposium on Nanotechnology Safety (Prague, 29-30 November 2010)

The Symposium was organised by the Institute of Experimental Medicine ASCR, the British Embassy in Prague, the Science and Innovation Network (UK Government), the Institute of Occupational Medicine (Edinburgh), the Institute for Work and Health (Lausanne), the Czech Platform on Industrial Safety and The European FP7 Network NanoImpactNet.

The objective was to bring together key players in the field of nanosafety from the EU countries and the USA, together with the Central European researchers and create a networking opportunity for future collaborations. 151 participants were present.

Publication:

Kubatova J., Pracna P.,(TC CAS) Nanomedicine Research in EU Framework programmes,
ECHO Journal, TC CAS, 5/2016
<https://www.tc.cz/cs/storage/fc5ea3a80bcd4c7188e11d3d9c830cb2cb57480?uid=fc5ea3a80bcd4c7188e11d3d9c830cb2cb5748>

The article informed in details on the results in nanomedicine research and its funding development in FP 7 and in HORIZON2020 from the academic research funding to fostering the support of the innovation and commercial application.

It brings an overview of key documents e.g. the Strategic Research Agenda for Nanomedicine, Roadmaps in Nanomedicine 2020 and Nanomedicine 2020-Contribution of Nanomedicine to HORIZON 2020 etc. and the respective calls and funded projects.

We do not feel that the role of nanomaterials in the fields of Energy is as broad as in Medicine and eventually food sectors in the Czech Republic

2. Nano for Energy

Nano-fibre materials for high-capacity batteries – [HE3DA](#), a company with strong research background and high commercialization drive.

Nano-based materials as components for solutions used in the Energy-efficient Buildings (in LEIT-NMBP) and Energy Efficiency (in SC-4) programmes.

Pardam – separators for batteries

TUL Liberec – Dpt. of nanotechnology and informatics

3. Nano for food

The target group of stakeholders in this area is also comprised within the Nanoprogress cluster, related especially to smart packaging. We may seek for further opportunities with the help of NCP for the Societal Challenge 2. See also CEITEC activities for more (above).

RCPTM – protein LAKTOSERIN magnetic extraction from milk whey

Pardam – RIFTELEN – filter for wine/oil based on anorganic membranes

Relevant event:

Conference RAFA 2017-8th International Symposium on recent Advances In Food Analyses (prague, November 7-10) organized by the University of Chemistry and Technology Prague and UNI Wageningen,

Presentations focused on the Nanoparticles in Food, Soft nanomaterials in the agri-food sector (UNI

Hard nanomaterials in the agri-food sector, Advanced ICP-MS-based methods for the analytical determination of inorganic nanomaterials in food, Efficacy and safety of nanomaterials used in nutraceuticals-

<http://www.rafa2017.eu/>

Relevant stakeholders – contacts:

Health / Medicine		
Nanoprogress	www.nanoprogress.cz/en/	komarek@nanoprogress.cz
Nanopharma	www.nanopharma.cz	berezkinova@nanopharma.cz
TU Liberec	www.tul.cz	david.lukas@tul.cz
Contipro	www.contipro.com	info@contipro.com
Prospion	www.prospion.cz	zdenek.cejka@prospion.cz
Student Science	www.studentscience.cz	evzen.amler@lfmotol.cuni.cz
Advanced Materials	www.amjtj.com/en/	jan.prochazka@advancedmaterials1.com
Bioinova	bioinova.cz/en/	petr.bazant@bioinova.cz
nanoComposix	nanocomposix.eu/	jana.kreckova@nanocomposix.eu
Energy		
HE3DA	www.he3da.cz/copy-of-domu	info@he3da.cz
Pardam	pardam.cz	jan.buk@pardam.cz
UCEEB	www.uceeb.cz/en	lukas.ferkl@uceeb.cz
CVVI	www.projectcentre.cz	jan.rakusan@cvvi.eu
CLB Písek	www.clbpisek.cz/en	stiblikova@clbpisek.cz
NanoEurohaus	www.europahaus.cz	tomas.turcan@europahaus.cz
Food		
ERA-PACK	www.erapack.cz/en/	marketing@erapack.cz
EPS	epsbiotechnology.cz/en/	petr.benes@epssro.cz
FILTREX	www.filtrex.cz	kopecny@filtrex.cz
Pardam	www.pardam.cz	Buk@pardam.cz
RCPTM	www.rcptm.com	Roman.jurečka@rcptm.cz

Relevant projects overview

International projects – TC CAS participation

FramingNano-International multi-stakeholder dialogue platform framing the responsible development of Nanoscience and nanotechnologies (FP7). A main document of the project is the FramingNano Governance Platform. Czech national conference “NanoRISK” aiming at informing Czech stakeholders (universities, researchers, industry, public administration) on the FramingNano Governance Platform document.

NanoCode-A multi-stakeholder dialogue providing inputs to implement the European Code of Conduct for Nanoscience & Nanotechnology research (FP7). An open and wide dialogue among a broader range of stakeholders in the field of nanoscience and nanotechnology. Czech national final conference “NanoSafety” aimed to present project outputs for the Czech stakeholders (academia, research, industry, public administration).

ObservatoryNano-European observatory for science-based and economic expert analysis of nanotechnologies, cognisant of barriers and risks, to engage with relevant stakeholders regarding benefits and opportunities (FP7).

International projects – other Czech participation

- a) Nanopinion-Monitoring public opinion on Nanotechnology in Europe (FP7). The Nanopinion aiming at monitoring public opinion on what we expect from innovation with nanotechnologies. In order to carry out this study, different modes of public participation are being organised. The project is aimed at citizens with a special focus on hard-to-reach target groups, i.e. people who do not actively show interest in science. Nanopinion project undertook a multichannel activity on public engagement in nanotechnologies. The project used an innovative outreach approach, focusing on dialogue, to monitor Europeans’ opinions on nanotechnologies across Europe. It included surveys, social media, discussions, street labs, events in public places. The platform is working in all national languages of the countries involved.
- b) MEDETOX - Innovative Methods of Monitoring of Diesel Engine Exhaust Toxicity in Real Urban Traffic (Community Programme LIFE). The project aimed to demonstrate innovative methods of monitoring toxicity of diesel engine exhaust emissions during real urban driving, with a detailed focus on the situation on the ring road of Prague. The results should be used for the improvement of the EU legislation relevant for the vehicle emission regulation.
- c) COST LD14041 – Nano-materials exposition, evaluation and healthy risk management with regard to the QSAR/ QNTR. The project focused on nano-materials and its nano-safety management.

Czech national programmes and projects

The Czech national projects mainly focusing on technical and experimental aspects of the nanotechnology research and development and its successful application into production. The projects are mostly funded by the [Technology Agency of the Czech Republic](#) (TA CR). The TA CR is an organisational unit of the state supporting the applied research and experimental development preparing its own programmes of applied research, experimental development

and innovation. To foster societal aspects of the applied research, development and innovation the OMEGA programme was realised (2012-2017). The programme was designed to implement projects focused on applied research and also support projects of experimental development (e.g. development of specialized software for modelling and simulation of economic and demographic trends, the impact of regulation and deregulation in various sectors, etc.).

Next very important step on the path to strengthen a multi-actor participation and RRI approaches in the R&D&I was the first call launch of the [ETA](#) programme in September 2017. The programme will support (2018-2022) projects that focus on utilizing benefits of multidisciplinary approaches, linking technical and non-technical research, extracting potential of basic research for application. The second call launch of the ETA programme will be opened in May 2018.

Example of the project funded by the TA CR (technical research, cooperation between public and private sectors):

Environmentally friendly nanotechnologies and biotechnologies in water and soil treatment - NANOBOWAT

The project aims to establish the Center NANOBOWAT combining capacity of three academic and six industrial entities for purpose of development and implementation of environmentally friendly nanotechnologies and biotechnologies applicable to purification and treatment of a wide range of water including groundwater, drinking, waste and surface water, with possibility of removal of organic, inorganic and microbial contamination. The strategic objective of the project was that the Czech Republic became the European leader in purification and treatment of water and soil.

The main activities of the project included development of technologies and pilot production in the field of reductive technologies, oxidative technologies, biotechnologies, nano/bio modified filters and membranes, combined technologies, analytical methods.

Question	Description of the requested information
Country	Czech Republic
Title national dialogue initiative	Environmentally friendly nanotechnologies and biotechnologies in water and soil treatment-Nanobiowat
When – what period	March 2012-December 2019
Short description of the initiative and its objectives	The project aims to establish the Center NANOBOWAT combining capacity of three academic and six industrial entities for purpose of development and implementation of environmentally friendly nanotechnologies and biotechnologies applicable to purification and treatment of a wide range of water including groundwater, drinking, waste and surface water, with possibility of removal of organic, inorganic and microbial contamination. The strategic objective of the project was that the Czech Republic became the European leader in purification and treatment of water and soil.
Organiser? Responsible actor?	3 Academic Institutions: Palacky University Olomouc (leader of the consortium), Technical University of Liberec, Institute of Microbiology CAS. 6 Commercial Companies (AECOM CZ, Inc., AQUATEST, Ltd.,

	DEKONTA, Inc., GEOTest, Inc., LAC, Ltd., MEGA, Inc.
Other actors? Target audiences	The project was funded by the Technology Agency of the Czech Republic programme fostering the long term cooperation in RDI between public and private sectors. The project involved stakeholders from academia and industry.
What methods and means were used for the initiative? With which aims?	One of the key research activities solved within the project is development of advanced iron based (nano) materials and their application in the field of reductive and oxidative water treatment technologies. For usage in reductive technologies are developed and optimized (nano) materials based on zero-valent iron (ZVI), which are suitable for effective degradation of wide range of inorganic (e.g., As, Ba, Cr, Cu, Se, U, Ni, etc.) as well as organic (e.g., polychlorinated hydrocarbons, BTEX, pesticides, etc.) pollutants mainly from groundwater and soils. For oxidative technologies are developed materials based on iron in high valence state (ferrates – Fe(IV, V, VI)), which are suitable for effective degradation of inorganic (e.g., As, U, Zn, Cu, Ni, cyanides, phosphates, sulphates, etc.), organic (e.g., hormones, pesticides, pharmaceutical compounds, etc.), and biological pollutants (e.g., cyanobacteria) especially for treatment of surface and drinking water. Advanced filtration technologies use filtration materials functionalized with a variety of nanoparticles. Such composite filters combine properties and advantages of both of the used materials. With respect to the filter application it is more than advantageous to connect a suitable filtration material with either nanoscale zero valent iron (NZVI) particles, silver nanoparticles (AgNPs) or their combinations. NZVI particles exhibit specific properties and as such can be used for the degradation of numerous inorganic (e.g. As, Ba, Cr, Cu, Se, U, Ni) and organic (e.g. polychlorinated hydrocarbons, BTEX, pesticides) pollutants. Thus, the composite filtration material with immobilized NZVI particles can ensure degrading of a variety of pollutants already in the course of the performed filtration. On contrary, AgNPs are well known due to their antimicrobial properties. If covalently bonded on a suitable filtration material, they are responsible for antifouling action due to the performed antimicrobial effect. This action can prolong lifetime of the filtration material without the threat of the AgNPs release into the filtration media. New developed advanced technologies and nanomaterials and its application are described in product briefs serving as very useful PR and sales support promo documents.
What kind of engagement or participation activities were	The project focuses on technical research and development in the field of the water purification and treatment and aim

involved?	to establish Centre of competence combining the capacity of public research organisations and private companies.
Were co-creation processes included? If yes, what outcomes were identified?	The Nanobiowat project highlights a tight cooperation among academia (research) and potential consumers-industry (application). The combination of an unique manufacturing technology and long-term experience in research & development allows to offer innovative materials with exclusive properties. All products are manufactured at industrial scale (Nanoiron Future Technology).
Outcomes of the initiative in general	A detailed list of publication, patents and other applied outcomes (approved technologies etc.) is available on the project website .
Recommendations for GoNano	The GoNano could be inspired by the private and public cooperation approach and including potential consumers (producers) into project activities.
References to the initiative	All publication and applied outcomes are available on the project website .

Question	Description of the requested information
Country	Czech Republic
Title national dialogue initiative	Innovative Methods of Monitoring of Diesel Engine Exhaust Toxicity un real Urban Traffic-MEDETTOX
When – what period	2011-2016
Short description of the initiative and its objectives	The MEDETTOX project aimed to demonstrate innovative methods of monitoring toxicity of diesel engine exhaust emissions during real urban driving with detailed focus on situation on the ring road of Prague. Epidemiological studies have found association between residence location near the busy road and pulmonary impairments as well as increase in the risk of cardiovascular disease and other ailments. Particulate matter in urban air is believed to be responsible, both in the Czech Republic and in the EU, for approximately one order of magnitude more premature deaths compared to traffic accidents.
Organiser? Responsible actor?	The project was supported by financial contribution of the European Commission LIFE and by the Czech Ministry of the Environment (project LIFE10 ENV/CZ/000651 Partners: Institute of Experimental Medicine CAS, Technical University of Liberec and Ministry of the Environment of the Czech Republic.

Other actors? Target audiences	The project focused on a multidisciplinary approach targeting stakeholders from the different fields (academia, researchers from the technical fields and medicine, policy makers and public).
What methods and means were used for the initiative? With which aims?	The use of innovative technologies and methodologies was demonstrated within this project as shown by multiple publications for broader public as well as for experts: www.medetox.cz/outputs-and-publications. Project findings, namely on discrepancies between the current knowledge and the reality, were reported several times by the Czech National Television, and in conjunction with DieselGate, by BBC1 (UK) and WRD (Germany). Considerable public awareness has been raised by the project, as demonstrated in the interest of politicians, regulatory bodies, students, industry, and citizens in general. A wide range of communication tools had been exploited in order to disseminate the outcomes to the stakeholders and other target audience. The most preferable dissemination methods were direct contacts with experts, face-to-face presentation at seminars and conferences. Many of scientific as well as popularisation articles have been published in the relevant journal and newspapers. The experts involved have been invited to refer on the project findings on TV and radio broadcasts. The project website presented the project results, reports and publications.
What kind of engagement or participation activities were involved?	The project included a wide range of the activities aiming to inform on project results and to strengthen the public engagement in the field of the air quality protection. The activities were divided into the following main parts: -Optimisation of on-board monitoring and sampling apparatus and methods in real traffic in Prague. -Optimisation of toxicity assays to on-board sampled diesel exhaust in cell-free system and in cell cultures. -Verification of optimized sampling and toxicity testing procedures –comparison of laboratory and real traffic conditions. -Measurement of toxic effects of diesel exhaust under various real traffic conditions in Prague -The effect of selected fuel additives (bio-fuels) on the diesel exhaust toxicity under real traffic conditions in Prague-pilot study. -Networking with other projects The project experts invited to the open panel discussion on air pollution in Mlada Boleslav town. Results obtained with mobile nanoparticles classifier in Líbeznice town. Design of ultrafine particles and carcinogenic polycyclic

	aromatic hydrocarbons on particles –experimental investigation in the Sporilov area (district of Prague) Results presentation at the Sporilov working group organised by the City of Prague.
Were co-creation processes included? If yes, what outcomes were identified?	Co-creation processes were not included exactly.
Outcomes of the initiative in general	Project results and project staff have contributed to the formation of the current plans to introduce monitoring of real driving emissions of nitrogen oxides and particulate matter in the EU. Portable on-board emissions monitoring systems (PEMS) for vehicle emissions measurements were used to uncover excess emissions during real-world operation, including the first “DieselGate” involving heavy vehicles and excess NOx emissions in the United States two decades ago, and including the “current” DieselGate affair with diesel automobiles. Demonstration of a miniature PEMS serves as an enabling tool to extent real driving emissions measurements, established in the EU legislation for heavy-duty vehicles and planned for automobiles, to motorcycles and other smaller vehicles within the EU legislation. Demonstration of online, on-road measurement of ammonia, nitrous oxide, and other pollutants of interest with a portable FTIR serves as an enabling tool for real driving emissions limits of such compounds within the EU legislation. Demonstration of low-cost miniature particle sensor serves as an enabling tool for replacement or supplementation of the current capacity measurements during periodic vehicle inspections with another method capable of assessing the functionality of a diesel particle filter. Project findings and background information gathered during the project have been used in citizen actions against unwise land-use choices that would have likely resulted in deterioration of air quality, including a construction of a large shopping center which would have brought large amounts of traffic into a historical city center. Ambient air measurements have sparked an interest from local authorities and citizen groups to assess air quality on a local (microscale) basis. Project findings on the reality of motor vehicle emissions have been implemented in many public lectures, including lectures at many conferences, but also at the Committee for Sustainable Transportation of the Czech Government, at political meetings, and at meetings and seminars for technicians. Toxicity assays demonstrated within the project have, along with different types of laboratory toxicity assays carried by

	several other groups, contributed to the increase in cooperation between engineering and toxicology groups in the field of a more direct assessment of effects of new fuels and technologies on health risks. Technologies and methods demonstrated within the project are directly applicable to small home heating appliances, another distributed source of air pollution responsible for a large fraction of total particulate matter in the air.
Recommendations for GoNano	Technical and methodological solution of the problem of the potential health risk of engine exhaust was the main objective of the project. The project highlighted results' and findings' dissemination and promotion through a variety of the events with potential <u>consumers</u>. The GoNano could be inspired by the multidisciplinary approach and including potential consumers into dissemination activities.
References to the initiative	A list of publications is available at the project website.

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In general, Austria is a country with little tradition in public dialogues on technology issues including nanotechnologies. There have been a few initiatives in the late 1990s and early 2000s but these hardly resulted in a more widespread participatory culture. Administrative representatives and policy-makers were described to not see much value in public dialogues beyond public relation benefits (Degelsegger/Torgersen). Therefore public dialogues, involving the general public, often take place in the context of EU projects such as NanOpinion (captured by the project reviews) or include single events such as the three panel discussions on nano technology (in 2007) in the context of the Risk-dialogue organized by the Austrian Environmental Agency. However such initiatives and events are hardly linked to technology and innovation policy and governance in Austria. No national dialogue initiative in a narrower sense has been taken place in Austria. On the side of Austrian ministries the focus is on information rather than ongoing dialogue with the public and the main medium is the NanoInformationsPortal (nanoinformation.at) that is described below. Dialogues between ministries, experts and stakeholders have a stronger relevance for nanotechnology governance in Austria and the most important forum is the Austrian Nano Information Commission (NIK) that was established in 2013. In the following we describe both initiatives separately.

Question	Description of the requested information
Country	Austria
Title national dialogue initiative	NanoinformationsPortal (nanoinformation.at)
When – what period	Since 2012
Short description of the initiative and its objectives	The portal is a public website providing information on nanotechnologies to the general public. The objective is to inform the public on the basics of nanotechnology, research and applications, risk and regulatory issues. The nanoinformation.at website is one of the recommendations that are rooted in the Austrian Nanotechnology Action Plan (2010); another one was to (further) establish an independent risk research program in Austria (EHS program³⁷).
Organiser? Responsible actor?	The portal is facilitated by the AGES - Austrian Agency for Health and Food Safety Ltd. with the Austrian Ministry for Labour, Social Affairs, Health and Consumer Protection (BMASGK) as the principal. A wide range of other organisations, including ministries, agencies and research institutions, contribute content to the website: - Bundesministeriums für Arbeit, Soziales, Gesundheit und Konsumentenschutz (BMASGK) - Bundesministerium für Nachhaltigkeit und Tourismus • Bundesministerium für Bildung, Wissenschaft und, Forschung (BMWFV) • Bundesministerium für Verkehr, Innovation und Technologie (BMVIT)

³⁷ <https://www.ffg.at/programme/nano-environment-health-and-safety> (02-16-2018)

	• Agentur für Gesundheit und Ernährungssicherheit (AGES) • Allgemeine Unfallversicherungsanstalt (AUVA) • Arbeitsinspektion (AI) • BioNanoNet Forschungsgesellschaft mbH • EU-Umweltbüro • Forschungsförderungsgesellschaft (FFG) • Montanuniversität Leoben • Nanonet Styria • NanoTrust (Institut für Technikfolgenabschätzung, Österreichische Akademie der Wissenschaften) Umweltbundesamt GmbH Wirtschaftskammer Österreich (WKÖ)
Other actors? Target audiences	The website is targeted at the general public in their role as consumers.
What methods and means were used for the initiative? With which aims?	The platform is a website which provides information on nanotechnology in form of texts (sometimes quite lengthy). The website provides the opportunity for contact but does not explicitly invite to do so.
What kind of engagement or participation activities were involved?	Informing – giving information to an actor in a one-way communication process (e.g. website, informing) (see above). Formally, the possibility is given to pose questions and consumer product related concerns which are answered by an expert consortium.
Were co-creation processes included? If yes, what outcomes were identified?	No
Outcomes of the initiative in general	No outcomes
Recommendations for GoNano	The initiative is a manifestation of the Austrian political culture and administrative actors' views of the public. The public is uni-directionally addressed in a rather prosaic way. GoNano shouldn't follow the example of the initiative in terms of methods but can learn that the political culture might be still biased towards such forms of the "involvement" of the public.
References to the initiative	https://nanoinformation.at/ Haslinger, Julia (2013): Nano-Governance durch Dialoge. NanoTrust Dossiers No. 38. Institut of Technology Assessment, Vienna. http://www.austriaca.at/0xc1aa5576%20x002de3f4.pdf

Question	Description of the requested information
Country	Austria
Title national dialogue initiative	Austrian Nano Information Commission (NIK)
When – what period	Since 2013
Short description of the initiative and its objectives	The NIK is an interdisciplinary advisory board for the Minister of Health, who is responsible for the protection of

	consumers' health. It concerns societal relevant aspects of nanotechnology and nanomaterials, and ensures a strengthening of interdisciplinary risk evaluation representing the diversity of opinions and the state-of-knowledge of various scientific expertise.
Organiser? Responsible actor?	The NIK is run by the Ministry of Labour, Social affairs, health and consumer protection (BMASGK). The NIK is chaired and facilitated by the leader of the project NanoTrust at the Austrian Institute of Technology Assessments.
Other actors? Target audiences	The NIK consists of around 20 members from ministries, agencies, universities as well as one Civil Society Organisation (CSO).
What methods and means were used for the initiative? With which aims?	The main task of this commission, which meets three times a year, is to (1) provide all members with information on the current research and developments in the field of nanotechnology safety, to (2) offer an opportunity to discuss and evaluate these findings and (3) to foster safety-relevant research concerning the use of nanomaterials in Austria. During the meetings, presentations are held and discussed by external experts for further insight into national nanotechnology research. Also, current issues on nanotechnology regulation and governance are being discussed. Additionally, recent publications and research results on nanotechnology and regulation are presented based on an ongoing publication monitoring that is organized by the project NanoTrust.
What kind of engagement or participation activities were involved?	The NIK therefore combines different elements of information, debate and consultations. Information: it serves as a means to ensure a general level of information on current nanotechnology related issues between the member organizations, thus tightening information exchange between these risk governance actors. Means to do so are manifold and range from publication monitoring, expert talks and specific information formats (e.g. NanoTrust Dossiers) Debate – (expert) discussions among participants Consultation – The NIK does provide advice and information to the Ministry of Health (BMASGK) and enables information exchange and timely discussion of upcoming issues for the nano governance system in Austria.
Were co-creation processes included? If yes, what outcomes were identified?	No
Outcomes of the initiative in general	A well-informed network to provide input on and discuss current questions of nanotechnology risk governance.
Recommendations for GoNano	The initiative is a further manifestation of the Austrian political culture in which policy-making occurs in rather closed networks. Despite efforts to include further CSOs into

	the Commission the NIK remains constraint to a core group. GoNano could learn about the difficulties to widen established networks.
References to the initiative	Fuchs, Daniela; Gazsó, André (2015) Nano Risk Governance: The Austrian Case. Pia-Johanna Schweizer & Ortwin Renn (Guest Eds.): International Journal of Performability Engineering, Special Issue 'Risk Communication and Risk Governance', Bd. 11 (6), S. 569-576. Gazsó, André; Fuchs, Daniela (2016) Nano Risk Governance. Extending the Limits of Regulatory Approaches through Expert Dialogues. In: Scherz, C.; Michalek, T.; Hennen, L.; Hebáková, L.; Hahn, J. et al. [...] (Hrsg.), The Next Horizon of Technology Assessment. Proceedings from the PACITA 2015 Conference in Berlin; Prague: Technology Centre ASCR, S. 353-357, S. 447 (Ref.).

APPENDIX 10 STATE-OF-THE-ART IN PUBLIC ENGAGEMENT:

FINDINGS FROM THE LITERATURE

1.1 From informing to upstream engagement

The discussion on the role of public participation in science and technology can be traced back to the 1960s, when the first negative impacts of technological development for the environment became clear with Rachel Carson's environmental science book 'silent spring'. In her book, Carson documented the adverse effects on the environment of the use of pesticides and accused the chemical industry of spreading disinformation, resulting in the public no longer unconditionally accepted science and technology. Carson's adaptation of scientific uncertainty to environmental policy making is regarded as a historical precedent for technological innovations, such as global warming, nuclear power, cancer studies, and GM food (Whang, 1997). In this period, Habermas (inspired by Dewey) made a plea for policy consultation from a 'pragmatist model' of science, implying that scientific and technological knowledge has to be assessed in the light of normative evaluative standpoints (Hennen & Pfersdorf, 2014).

However, the focus back then was mainly on educating and informing, and later on persuading the public about the benefits of science and technology for society. These strategies were derived from the 'deficit model', which assumed that the public was negative about scientific innovations because of a lack of knowledge (Wehrmann & Dijkstra, 2014). From various studies (e.g. Dijkstra, 2008; Wilsdon & Willis, 2004) it became clear that solely informing did not suffice as a means of legitimating science, as citizens who became more knowledgeable also became more critical. The 'deficit model' was replaced by the 'dialogue model', which focused on two-way communication between science and society. Even though scientists and policymakers underlined that they could learn from the public's views and demands, the dialogue approach still was restricted to communication without really engaging the public itself (Hennen & Pfersdorf, 2014). Following the line of responsible research and innovation (RRI) derived from Science and Technology Studies (STS), also the dialogue model did not suffice anymore as it was still too much focused on creating acceptance (Hennen & Pfersdorf, 2014). Scientists and policymakers should not only getting into dialogue with the public, as this is mainly focused on creating acceptance, but implementing the needs and concerns into their agenda (Owen, Magnaghten, & Stilgoe, 2012).

From the notion of reflective and responsive science, processes of 'upstream engagement' and 'co-production' evolved to make sure that the voice of the public was included in research and policymaking. According to Arnstein (1969), who already distinguished different levels of participation in the 1960s, upstream engagement, co-production or co-creation, are among the highest levels of citizen participation. Within the political sphere Arnstein noticed that while many people advocated for participation, it was often used as an empty ritual for legitimization of power by politicians instead of giving real power to citizens. She advocated for processes of participation in which citizens had real power, which we would now label as co-creation.

1.2 Effective forms of public engagement

Many studies have been conducted on the evaluation and development of public engagement techniques. Only few are actual 'upstream engagement', while a large part either focused on 'deficit' or 'dialogue' model. Therefore, Rowe and Frewer (2005) proposed a categorization of

three types of public engagement, based on the flow of information between participants and initiating actors: 1) public communication (information is conveyed from the initiating actor to the public), 2) public consultation (information is conveyed from members of the public to the initiating actor), 3) public participation (information is exchanged between members of the public and the initiating actor). According to Rowe and Frewer (2005), effective engagement exercises relate to the fairness principle (acceptability, equity, democracy, representativeness, transparency, and influence) and to the efficiency principle in achieving its purpose. Reed et al. (2017) emphasize that ‘upstream engagement’ is not necessarily always a better form of engagement (as Arnstein for example would argue), but that effective engagement exercises depend on various factors, including: context, design, power dynamics, values of participants, and time. In line with this, Dijkstra (2008) found that public engagement does not always have to be a two-way process, as not every citizen wants to be engaged (even when interested in the subject matter), which can be linked to the factor of ‘values of participants’.

Reed et al. (2017) identified four elements to take into account when organizing effective engagement processes. First, engagement processes should be linked to the cultural context in which they are being organized. Cultures that have a long tradition of engagement allow for more freedom in participation and a less stricter freedom and smaller role for the moderator or facilitator of the participation event, than cultures with less experience. Second, engagement processes should represent as many relevant public and stakeholder interests as possible and provide opportunities for these publics and stakeholders to influence the outcomes. In this way different opinions and values are taken into account, participants feel more involved, can learn from each other and will be more likely to accept the outcomes. Third, power dynamics should be managed carefully; professional facilitation and mediation is crucial for this. Also, when designing public engagement processes this should be taken into account. Maclean and Burgess (2010) argued that separating experts and stakeholders from (less informed) citizens might be a solution, as citizens can be constrained in their participation by the framing of issues by stakeholders and experts. Fourth, outcomes of public engagement processes are dependent on the time-scale. It is therefore important to match the length and frequency of engagement to the goals of the process, and to be aware that changes in values are less likely to occur than changes in preferences (Reed et al., 2017). Preferences for one option over the other may change over time, but values are less likely to change. Furthermore, when designing public engagement processes, a number of (potential) challenges should be taken into account.

1.3 Challenges in public engagement

As the literature and practices on public engagement processes has increased, evaluations and reflections on these practices have also increased. These reflections detected a number of challenges and tensions. Below the most important of them are discussed.

Diverging motives

One tension that is often mentioned in literature relates to the motives of organizing and participating in public engagement events. According to Fiorino (1990), three types of motives for public engagement can be detected: instrumental, substantive, and normative. Engagement activities are instrumental when they aim to achieve a particular predefined end. A substantive motive suggests that public engagement will actually lead to better results (e.g. for decision-making). When public engagement is driven by a normative motive, it is seen as the ‘right thing

to do' based on norms and values (Delgado et al., 2011; Selin et al., 2017; Stirling, 2008). While in theory a clear differentiation can be made, in practice they are closely intertwined and there are often a plurality of views on the motives. For an organizing actor it is important to be aware of his or her own motive(s) behind the engagement practices, and to communicate this clearly. Tensions particularly arise when there is a lack of transparency around the motives behind the engagement processes, or when engagement events have been theoretically argued for according to one motive, but then designed, enacted and/or evaluated according to the other (Delgado et al., 2011).

Also, the motive of the participating actors should be clear and transparent. Often, different actors have different motives for participating. Van Oudheusden (2011) found in their evaluation of the Flemish participation project on nanotechnology (NanoSoc), for example, that participatory assessment researchers (pTA) were concerned with changing political decision-making (substantive objective), while nanoscientists were mostly interested in promoting nanotechnologies among the public (instrumental objective). He concluded that it is important that different motivations among participants are discussed openly (Van Oudheusden, 2011). In line with these results, Krabbenborg and Mulder (2015), found in their evaluation of two Dutch public engagement initiatives on nanotechnology, that "existing roles and responsibilities of technology developers and civil society organizations (CSOs) did not match well with the governance ideals and early-stage dialogues" (p. 474). Both actors argued along established lines, with the CSOs focusing on the concerns and risks of nanotechnology, and the technology developers embracing all aspects of nanotechnology.

Problem of closure

Closely related to the tension of different rationales among the participating actors is the challenge of aiming for consensus. Public engagement practices can be opened up for deliberation between views (democratic openness), as well as closed down through emphasizing the importance of consensus and decision-making (technocratic closure) (Stirling, 2008). To achieve participatory decision-making, it is arguably important to combine both stages (Burgess, 2014). However, when citizens, policy-makers and experts express irreconcilable views (among themselves and between each other), the dilemma arises of how and when to reach a decision, which is called in literature 'the problem of closure' (Delgado et al., 2011).

According to both Delgado et al. (2011) and Van Oudheusden (2011), an open recognition of challenges, pitfalls, and tensions with regard to technical closure is an important first step. A second step would be to explore fundamental differences in motivations and perspectives between the participants and try to systemically draw these out, rather than developing a common understanding and pushing the participants to reach a consensus that is substantively and normatively questionable (Swierstra & Rip, 2007; Van Oudheusden, 2011).

Power dynamics

When exploring differences and aiming for consensus among and between different actor groups, another challenge might evolve, that is, the power dynamics between actors. Davies (2011) found in her analysis on dialogue events that audience members are relatively powerless. Mostly because of the setting in which an expert starts to talk in front of the audience, with the audience immediately being placed in the role of listener. Furthermore, by introducing

the speaker as an expert and providing a lengthy introduction with his or her academic achievements also places the audience in the laity position. Facilitators, who stand in front of the room and tell the audience what to do, often endorse the role of 'listener' and 'lay-person'. Also, these facilitators grant permission to audience members and speakers to take the floor, define and enforce the rules of interactions, direct them (in telling them where to sit for example, or when to vote), and define and police norms on the topic (cutting off discussion which is not 'relevant') (Davies, 2011, p. 71).

Davies did not come up with a solution or a normative evaluation of the power dynamics, but she emphasized that it is important to be aware of these dynamics. Selin et al. (2017) agreed with the notion that power dynamics should be taken into account when organizing public engagement events, and proposed a solution. They argued "engagement activities seeking to enhance citizens capacities need to be citizen-led, in terms of both substantive content explored and the process deployed" (p. 639). This includes giving citizens the power to shape the agenda of the event and creating a safe atmosphere, with an active and honest dialogue in which the contribution of each individual is appreciated.

Van Oudheusden (2011) adds that next to the social power dynamics between people, also the power of discourse should be taken into account. He found in his analysis on NanoSoc that "interpretative strategies compete for domination in the meaning making process, as people struggle to present their accounts as factual and stable representation of the world", which he calls the 'argumentative struggle' (Van Oudheusden, 2011, p. 679). As a solution he proposed to make clear from the start that different publics and stakeholders have contending issues. Using these contending opinions and issues as a starting point, gives room to come to a new discourse (Van Oudheusden, 2011; Rowe & Frewer, 2005). Active facilitation of the event, with participants being challenged to come up with better alternatives rather than settle with the first strategy is a way to get this work (Rowe & Frewer, 2005). Nevertheless, the facilitator should guide the session in such that all participants feel that they have the power to participate. Moreover, facilitators should prevent actors from dominating each other and create a safe environment for all actors to give their input (Reed et al., 2017).

1.4 Defining the 'publics'

An important factor in public engagement processes is defining the publics. Some scholars (e.g. Rowe & Frewer, 2004) would argue that for an engagement exercise to be effective, the principle of representativeness should be taken into account, implying that participants who are representative of the affected community should be selected. However, the 'affected community' is a rather broad concept, and in practice it is difficult to select a representative sample. Jasanoff (2003) stated, for example, that direct involvement of all members of the public in techno-scientific development is not feasible, and therefore selection criteria should be formulated. Various dimensions are mentioned in the literature on the debate as to how to define the public and relevant selection criteria.

One dimension is the construction or framing of 'the public', which can be done in different ways. In their study on public engagement events regarding nanotechnology, Wickson, Delgado, and Kjolberg (2010) distinguished three constructions of publics: laity, consumers, and stakeholders. Braun and Schultz (2010) came to four constructions of the public in their study on genetic testing: general public, pure public, affected public, and partisan public. Different

constructions influence the justification and the objectives of the engagement event. Framing the public as general public implies a low level of engagement, mainly focused on one-way communication aiming at either informing them or collecting attitudes and perceptions. The same goes for 'laity', although the level of engagement can be also two-way communication (pure public), in which citizens without knowledge and expertise are invited to small engagement events such as citizens juries or consensus conferences (Braun & Schultz, 2010; Wickson et al., 2010). Inviting participants who are affected by the potential application(s) of the technology and seen as consumers or affected public, aims for gathering specific knowledge that can be used for the further development of the innovation. Another aim would be the creation of acceptance for the technology (Wickson et al., 2010; Braun & Schultz, 2010). Inviting stakeholders or partisan public focuses on collecting information about the landscape and possible arguments in favor or against the technology, with the aim of ensuring that the development proceeds through careful consideration of the potential impacts and interests involved (Braun & Schultz, 2010; Wickson et al., 2010). When selecting the participants, it is important to be aware of the different constructions and match the selection to the objectives of the public engagement event.

A second dimension to take into account is the knowledge component. The debate as to whether only experts or also laypeople should be invited is approached from both a normative and a functional perspective. Collins and Evans (2002), for example argue that only people who have technical or scientific expertise should be invited, as a layperson could not make any relevant contribution and would even hinder the participation process. Wynne (2003), on the contrary, states that this distinction should not be made as all citizens have a role in science and technology development, because science and politics, or facts and values, are intrinsically intertwined. Besides this normative argument, from a functional point of view, it can be argued that laity should also be invited in the participation process. Wynne (1989) already found in the 1980s that lay-people, in his study sheep farmers, can have valuable knowledge, in this case about sheep habits, local physical environment and decision-making. All of this knowledge is useful and should be integrated with more formal and abstract scientific knowledge. In addition, Wynne (1980) emphasized that laypeople are able to process complex information and can reasonably judge uncertainty and risks.

A third dimension that should be taken into account in selecting publics for participation events includes cultural values and beliefs. It has become clear from various studies that these factors influence attitudes to nanotechnology and perceptions of its risks. Kahan et al. (2008) found in their experimental study that public attitudes with regard to risk and benefits on nanotechnology are likely to be shaped by cultural beliefs. For example, people who are individualistic and hierarchical in their cultural worldviews tend to dismiss claims of environmental risks as it would threaten the autonomy of markets. Additionally, in their comparison on deliberation events between the US and UK focusing on nanotechnologies for energy and health applications, Pidgeon, Harthorn, Bryant, and Hayden (2008) found subtle differences across the two countries, and also across the two application areas. Within the UK there was more focus on potential risks and in the US there was a higher technical optimism. Further, on the area of energy nanotechnology was viewed much more positive than in the health area.

1.5 Lessons for GoNano

Based on the large amount of literature on public engagement, various lessons can be learned to take into account for GoNano. In GoNano, the aim is eventually to organize a co-production event with citizens and stakeholders shaping research agendas and potentially policy agendas. The ideal behind these co-creation processes is that civil society should have a say in decision-making processes regarding the further development and embedment of nanotechnology in society (Krabbenborg & Mulder, 2015). Within GoNano, the engagement processes are initiated top-down. Irwin (2001) noted that the downside of top-down (invited) public engagement is that it predetermines who is a relevant participant, and also carries implicit assumptions about how citizens should participate. Nevertheless, Delgado et al. (2017) stated that with some (emerging) technologies there is a lack of direct experience of hazards or a lack of awareness, and therefore invited engagement practices are needed. This might be the case with nanotechnology as most research suggest that public's perceptions of nanotechnology are primarily positive (Dijkstra & Critchley, 2016). Furthermore, top-down initiated public engagement exercises provide the opportunity to influence the design and strategically choose the publics and stakeholders who engage. Both are important characteristics for successful engagement processes (Reed et al., 2017).

When selecting the publics for the citizens consultation, we should carefully think of how we construct the public. These constructions can differ among the application area. In the area of health, relevant publics could be the general public, patients, family of patients, people working at hospitals, while for the area of food the general public is also the consumer. In addition, we should carefully think of other criteria that should be taken into account for selecting the audience. For the citizens consultation workshop it might be wise to select people from different local communities, with different values, and a different social economic status. In addition, the knowledge component should be taken into account. It might be counterproductive for power dynamics if we invite citizens who have a lot of knowledge about nanotechnology along with people who have hardly any knowledge. From this point of view, it is good in GoNano that stakeholders are invited for a separate session.

The motives and goals for the citizens consultation and co-creation workshop should be clearly defined and communicated. On the one hand we are looking in GoNano for input on a research agenda on nanotechnology in three areas, focusing on three innovations per area. However, in GoNano we are also looking for a way to engage citizen and stakeholders in science and we should clearly define our objectives in this regard as well.

When designing the methodology for the citizens consultation and co-creation workshops, we should make sure that participants feel empowered to engage. The role of the moderator, the way information is presented and the way the debate is set up are important elements for this. Furthermore, especially with regard to the stakeholder workshops the problem of closure might appear, as some parties can think fundamentally different on issues. These fundamental differences should be approached in a constructive way, without forcing stakeholders to conform with a compromise they do not agree with. It is good to explore whether the differences evolved from preferences or from values, as values are much harder to change than preferences.

Next to these lessons derived from literature, it is interesting to see what we can learn from engagement initiatives that have been organized in practice. In the following section these will be discussed.

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