NANO2ALL

SOCIETAL ENGAGEMENT ON RESPONSIBLE NANOTECHNOLOGY

Responsible Innovation Agenda at European level

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1. Introduction

1. INTRODUCTION

1.1. NANO2ALL project

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

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

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

1.2. The NANO2ALL dialogues

To date, NANO2ALL has organized a range of dialogue events across Europe using a three-phase dialogue approach. This approach encompassed the consecutive organization of 1) a set of national citizen dialogues in 6 European countries (April-June, 2017), 2) a set of national multi stakeholder dialogues in the same 6 countries (October 2017-February 2018), and 3) the organization of a final European stakeholder dialogue event in Brussels (April, 2018) (Fig.1). Each of the dialogue phases was characterized by its own specific aim, scope and set of dialogue methods. And although each of the dialogues can be seen as a self-contained event, the outcomes of the different dialogue phases did feed into each other, i.e. the outcomes of the citizen dialogues were used in parts of the national multi-stakeholder dialogues, and the outcomes of the multi-stakeholder dialogues were used as enriching discussion material in the European dialogue event. The dialogues allowed for deliberation of values and purposes underlying a responsible technological future for nanotechnology, and the articulation of recommendations to enhance responsiveness and societal engagement in nanotechnology research and innovation processes, both at national and EU levels. These recommendations have been translated into two deliverable documents: *D3.3 Responsible Innovation Agendas at national level*, and the current document, *D3.4 Responsible Innovation Agenda at European level.* A final step in the project (Work Package 4) will be to translate the innovation agendas into a roadmap that presents an action plan on how the responsible innovation agendas can be brought into practice.

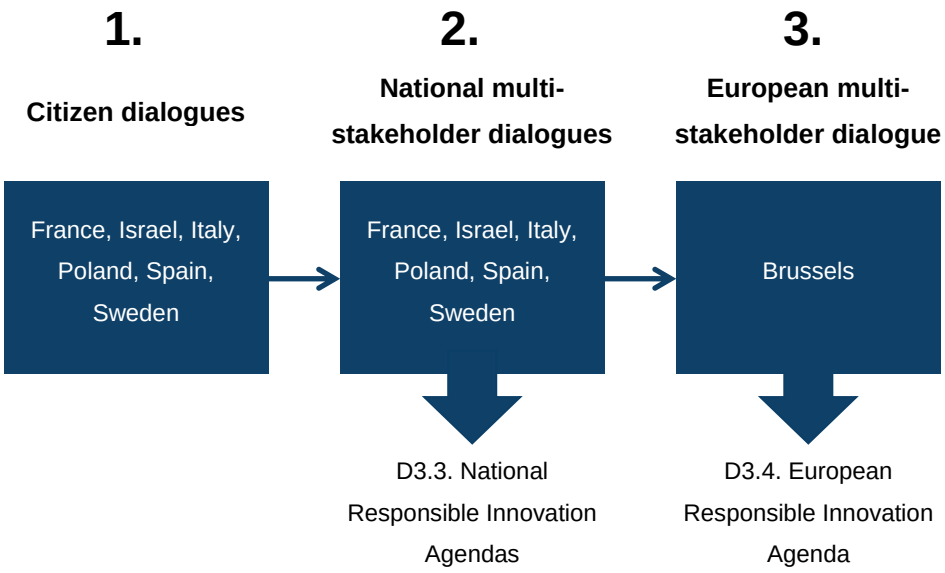

Fig. 1. Overview of the NANO2ALL three-phase dialogue methodology

1.3. Purpose of this document

This report D3.4 presents the responsible innovation agenda at EU level that was conceived based on the outcomes of the NANO2ALL European dialogue event held on April 9th, 2018 in Brussels. This agenda provides directions and recommendations for both the EC and other actors in the nanotechnology research and innovation ecosystem on how to make nanotechnology research and innovation more responsive towards societal perspectives. A preliminary version of this agenda was sent to the EC in April 2018 to allow for its use in the drafting of an internal EC policy note on nanotechnology governance.

Note that the European dialogue event and the resulting responsible innovation agenda did not focus on the concepts of inclusiveness and engagement (as was the case in earlier activities of the NANO2ALL project), but instead revolved around the broader concept of responsiveness towards societal perspectives. This choice was made after several of the national dialogues had taken place, in which we noticed that the focus on inclusiveness and engagement as an end goal in some cases obscured discussion on how engagement activities can truly be translated into policies and institutional change. By using the term 'responsiveness', we aimed to allow for the sharing of a broader set of ideas on how to take societal perspectives into account, and to shift the focus from "inclusion as an end goal" to the question of what is needed to make the nanotechnology research and innovation system more *flexible to adapt* and truly *respond* to perspectives of stakeholders and citizens.

The following chapters of this document will describe the EU dialogue methodology and present the ideas that were harvested during the dialogue session itself (i.e. the recommendations to enhance responsiveness). A final chapter shares some reflections on the dialogue session's atmosphere, the format in practice and the dialogue participant group composition.

2. Dialogue methodology

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2. DIALOGUE METHODOLOGY

This chapter provides an overview of the methodology that was designed for the NANO2ALL European dialogue event held on April 9th 2018 in Brussels. The event took place at the Joint Research Centre of the EC and was attended by a selected group of stakeholders from diverse backgrounds. The goal of the dialogue session was to find out collectively what would be needed to make the nanotechnology research and innovation ecosystem more responsive to societal perspectives.

2.1. Recruitment of European dialogue participants

The NANO2ALL project used a careful participant selection process to identify and invite relevant stakeholders to the European dialogue event. The organizers aimed to make sure that the group of dialogue participants varied in terms of backgrounds and perspectives on the dialogue topic. The organizers first created different participant profiles based on stakeholder groups (i.e. nanoscientists, policy-makers, industry, civil society organizations, and "intermediaries", such as media representatives, RRI experts, social scientists and ethicists). These were sent to all consortium members of the NANO2ALL project, who then used the profiles to select relevant contacts from their networks and created a list of suggested people to invite. The organizers screened all the suggestions and performed an additional internet search to ensure sufficient variety in perspectives on topics of nanotechnology governance and societal engagement. The organizers also invited several participants from the earlier national dialogue events that were hosted across Europe (both citizens and stakeholders). This would allow for inputs from the national dialogues to reach the discussions at European level. A final selection of 120 people was contacted via personalized invitation emails and phone calls, 40 of them registered for the event, and 29 of them eventually attended. In the table below, an overview can be found of the types of stakeholders that were present in the dialogue session. As shown here, it was particularly challenging to involve civil society organizations (CSOs) in the dialogue event. Chapter 4 reflects in more depth on this issue.

Stakeholder category	Number of participants in European dialogue
Nanoscientists	4
Policy-makers	7
Industry	8
CSOs	1
Intermediaries (media representatives, RRI experts, ethicists, social scientists)	8
Citizen dialogue representatives	1

Table 1. Stakeholder groups present in European dialogue event. The total number of dialogue participants was 29 (15 men, 14 women). Six participants had already attended one of the earlier national NANO2ALL dialogue sessions. Some participants could be clustered amongst multiple categories (i.e. some industry representatives in this table were nanoscientists working for a company). Here, we chose to cluster them according to the stakeholder category they had indicated to identify themselves with most, which was industry.

2.2. The European dialogue format

The European dialogue was a one-day event structured according to a dialogue format that consisted of five main exercise blocks (see Fig. 2) The two morning exercises were of an exploratory character, focusing on the concept of responsiveness and what this concept would look like in different future worlds and different nano-enabled application scenarios. The three exercises in the afternoon concentrated on the identification of concrete actions that are needed to make the nanotechnology research and innovation system more responsive and on formulating recommendations to the EC.

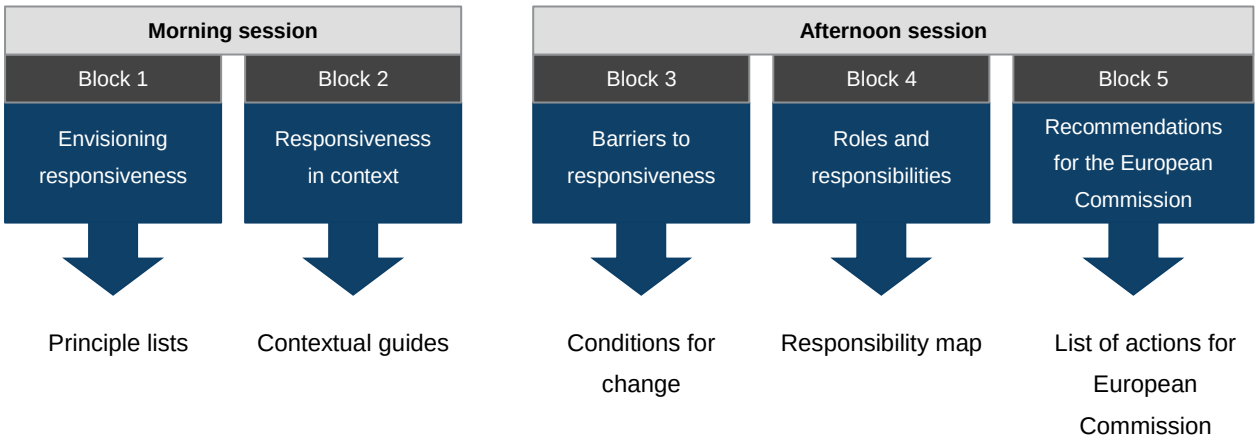

Figure 2. Overview of the European dialogue format

2.2.1 Morning session – exploring the concept of responsiveness

The morning session started with a plenary introduction in which the NANO2ALL project was introduced and the workshop goals were clarified. Upon entering the workshop room, each of the participants had received a "passport to the future", a small booklet with workshop information and some reflective questions that could be answered throughout the workshop exercises. The first questions in the booklet were filled out and discussed in the plenary introduction to capture the first associations of the participants with respect to the term "responsiveness".

After the plenary introduction, the participants were divided into six groups for the first exercise block to discuss the question "What would responsiveness look like in different future scenarios?" Each participant group explored a future scenario (for the year 2050) depicted on a mood board and used Lego, drawing, and writing materials to "build" responsiveness into that particular world[1] (Fig. 3). Subsequently, each group condensed their outputs into a list of principles of responsiveness. These lists of principles were displayed around the room and participants were asked to take a look at each of them and individually write down (in their passport to the future) the three principles they themselves found most important.

In the second exercise, the participants formed new groups and collaboratively explored what their most important principles would mean in the context of narratives around various hypothetical nano-enabled applications, which were visualized on big A0 posters[2] (Fig. 4). Who should do what? When? And for what reason? These details and discussion points were written down on sticky-notes and added to the poster sheets, resulting in so called "contextual guides".

Fig. 3. Exercise 1: envisioning responsiveness

Fig. 4. Exercise 2: responsiveness in context

2.2.2 Afternoon session – working towards recommendations on how to enhance responsiveness

The third exercise block started after the lunch break. Participants grouped together in their own stakeholder groups to which they assigned themselves (i.e. policy-makers, nanoscientists, industry, CSOs, intermediaries). The

[1] The scenarios depicted on the mood boards represented a decentralized technophilic world versus a centralized technophobic world. These two scenarios were derived from the work that was performed in an earlier phase of Work Package 3: the development of scenarios for the Scenario Exploration Game, see D3.2. for more information.

[2] The hypothetical nano-enabled applications were based on the input acquired during the NANO2ALL citizen dialogues. In these dialogues, citizens were asked to prototype a hypothetical nanotechnology application and build an ambiguous narrative around it. The applications and narratives were later visualized by the project into "citizen science fiction" posters. These posters were used in the second exercise of the EU dialogue. For more information, see D3.1.

different stakeholder groups brainstormed about their experienced barriers to bringing responsiveness into practice and considered what would be needed to overcome these barriers (Fig. 5).

In a subsequent exercise, the participants mixed into new groups in which the different types of stakeholder categories were combined. Here, participants exchanged what actions they considered necessary to enhance responsiveness in the nanotechnology research and innovation system. Each participant shared what actions he or she wanted to undertake him/herself and what actions they felt other actors could undertake. These were mapped on big sheets (i.e. responsibility maps, see Fig. 6).

The workshop concluded with a plenary session in which participants shared some main insights based on their workshop experience and suggested specific recommendations for the EC.

Fig. 5. Exercise 3: barriers to responsiveness

Fig. 6. Exercise 4: mapping roles and responsibilities

2.3. Processing of dialogue data

After the European dialogue session, all data (i.e. audio recordings of some of the table discussions, exercise sheets, photos) were collected and analyzed. Input and observations from the table moderators were gathered to obtain a good overview of the topics and themes that were discussed in each of the dialogue rounds. The actions and recommendations that were suggested by the participants in the workshop to enhance responsiveness were condensed into a document presenting a set of recommendations clustered according to theme. This document was distributed to all the dialogue participants to comment on and suggest modifications before the outcomes and recommendations were included as such in this deliverable document.

3. European dialogue outcomes

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3. EUROPEAN DIALOGUE OUTCOMES

In this chapter, the main results of the dialogue are outlined. The first section briefly highlights some of the views and discussion topics that were brought forward in the exploratory first half of the dialogue event, i.e. the morning session. The second section of this chapter focuses on the most important part of the dialogue session; the afternoon session, in which the participants focused their efforts on working towards formulating actions that need to be undertaken by different actors (i.e. the recommendations). As a result this second section is more elaborate than the first.

3.1. Outcomes morning session

As mentioned in chapter 2, the first half of the dialogue was of an exploratory nature, aiming to grasp the concept of “responsiveness”. The discussions that took place at the different tables in the morning session varied in terms of focus, scope and approach. Some groups, for example, drew more heavily on scenario elements – provided by the dialogue format - to envision responsiveness, while others explored the concept from a more general perspective. In some groups, the participants talked about responsiveness as a process, emphasizing its continuous and two-way character. Other groups tried to grasp the term by raising more questions. What is the difference between responsiveness and responsibility? Who or what should be responsive? And to what or whom? Meanwhile, others focused on listing a range of themes that they associated with the term “responsiveness”.

When examining together the input that was collected during both exercise 1 and 2, it seems that the workshop participants associated responsiveness with a broad range of themes, topics and activities. Some aspects that were mentioned more frequently in the discussions include attention to the safety of nanomaterials and nano-enabled products throughout development processes, the management and regulation of risks, the anticipation of potential impacts of nanomaterials and nano-enabled products, the inclusion of societal voices in nanotechnology development processes, respecting and balancing different perspectives, and transparent, clear and unbiased communication about the use of nanomaterials and the production processes, as well as the associated risks and benefits. Evidently, the explorative nature of the group exercises also sparked further questions amongst the participants about the above-mentioned points. For example: which societal voices should be included? When? And how? Who should be responsible for managing particular risks? Companies or public actors? And does “unbiased” information actually exist? These questions were not necessarily resolved during the discussions, but triggered further reflection on what responsiveness is about and what would be needed to enhance it.

3.2. Outcomes afternoon session (recommendations)

The paragraphs below provide an overview of the themes that were discussed in the afternoon session. They present ideas on actions and initiatives that could be stimulated, funded, promoted or facilitated by the EC and the various actors involved in the nanotechnology research and innovation system. An overall observation made by some of the participants was that the issues raised during the workshop exercises are still very similar to those that were brought up 10 to 15 years ago, suggesting that little has changed in the discussions over the years. Yet, one change that the participants did remark is that the “nanotechnology field” seems to be dissolving. Nanomaterials are increasingly being treated as all other chemicals, and nano-enabled products are more frequently discussed from the perspective of their application context instead of their relation to nanotechnology.

3.2.1 Fostering a culture of collaboration and transparency

Participants stressed the importance of transparency in nanotechnology research and innovation processes. At the moment, it is difficult for media and other actors to access information and data on nanomaterials. Company cultures, complex value chains, and fragmentation in the field with respect to applied methodologies, measures and reporting styles make it difficult to critically assess the work that is being carried out by others. Participants indicated that institutional and leadership changes are necessary in industry **to promote cultures of transparency.** They further advocated **the promotion of open access to data on nanomaterials** and more **sharing of data between scientists.** The latter would also require **standardization and harmonization of methodologies and reporting styles** to ensure that data quality can be checked and acquired insights can be translated and compared across different areas of nanotechnology research and innovation. A **post peer review system,** in which researchers from different nanofields can comment on data and its applicability in other fields *after* the official review process, was also mentioned as an example of how data quality and data sharing could be improved.

3.2.2 Fostering a participatory culture

Involvement of societal actors, including citizens, and interaction between stakeholders were considered important for building responsiveness in nanotechnology research and innovation. Participants stressed the need for **incentives and platforms for actors to structurally interact with other stakeholder groups.** In addition, participants mentioned that citizens are currently not always interested in participating in discussions on nanotechnology, because the selected topics of discussion are often technology-led, which pushes citizens to the "non-expert" role and limits their potential to participate equally. Public engagement initiatives should start from the issues experienced by citizens, and thus the need for **challenge-led forms of public engagement,** as well as **challenge-led funding of public engagement** was stressed. In all engagement efforts and spaces of interaction, attention should be paid to the **use of language** (e.g. preventing jargon, choosing terms that are non-judgmental). One other idea to enhance the influence of civil society and public values was to **increase political debate** at European level on research strategy and **increase the diversity (e.g. in terms of epistemic background, cultural background, gender) on the work floor** in all sectors, including the EC itself.

3.2.3 Fostering a culture of trust

Participants mentioned that trust is key for building responsiveness in nanotechnology research and innovation. Participants still experience a lack of trust between society, science and industry, which hinders interaction and mutual learning. To change this, participants argued for **honest and timely communication** by science and industry about their work, products and safety related matters, in a language that is understandable to different publics. Participants also expressed the need for **trustworthy intermediaries** with a mandate to facilitate interactions between different actors **in the long term.**

3.2.4 Fostering a scientific culture

Some participants expressed the need for a stronger scientific culture in society. An example that was mentioned was to attract the attention of citizens to discussions on science and technology by **cultivating and sponsoring appropriate media and role models** (e.g. games, TV shows, "star" scientists). Other participants described a scientific culture more in terms of critical thinking skills. They stressed the importance of **educational systems that stimulate the development of critical attitudes at a young age.** In this fast-changing world, full of

complexities and uncertainties, people should have the skills to critically judge information and sources for *themselves*. The need for **reinforcing the capacity of science media** (more resources, enhanced Europe-wide network of science journalists to be able to investigate cases that stretch beyond borders) was also mentioned. This would enable them to publish news and articles on developments in the field based on a more thorough analysis. This was considered relevant for developing a scientific culture within our society and providing balanced information on science and technology.

3.2.5 Fostering a culture of safety

Participants stressed that researchers and companies should **take safety on board as early as possible** in their research and innovation processes. The current lack of safety thresholds was mentioned as a barrier to responsiveness, and **the need for official guidelines on safety testing of nanomaterials** was stressed multiple times. One participant specifically expressed the need for stricter regulations on nano-enabled consumer products and mentioned that **lessons could be drawn from the field of nanomedicine**, where different safety guidelines are applied to products, based on how intimately they interact with the human body.

3.2.6 Fostering a culture of learning

Mutual learning was seen as an important aspect of responsiveness. Not only did participants refer to learning that should take place between different researchers and fields (on how to do safety assessments of nanomaterials, for example), but they also recommended the EC to stimulate learning from previous European projects and initiatives on nanotechnology governance. In the wrap-up exercise, one participant suggested the set-up of an **evaluation project** by the EC on **the impact of previous RRI/engagement projects in the field of nanotechnology**. What has been done with all the issues raised in these projects? What has been acted upon and what not? Another idea that was brought forward was to fund a project that assesses all that has been done in the field of nano in the past 15 years with respect to building responsiveness and explores how we can **transform the major learning lessons to other emerging technological fields.**

4. Reflections on the dialogue event

4. REFLECTIONS ON THE DIALOGUE EVENT

This chapter briefly reflects on the European dialogue event in terms of its atmosphere, format, and participant group composition. These reflections are based on the observations of the dialogue organizers, as well as an online evaluation questionnaire that was filled out by 19 out of the 29 participants.

4.1. Reflections on dialogue atmosphere

The organizers of the European dialogue even aimed to establish an open and respectful dialogue environment, in which each participant would have the chance to share his/her ideas and opinions freely and would feel stimulated to actively participate in the discussions. Considering the responses to the evaluation questionnaires, the organizers felt that they were successful in achieving such an environment to a large extent. On a 5-point scale, questionnaire respondents rated 1) the level of comfort to express their opinion and 2) the ability to share ideas and concerns as 4.6 and 4.2 respectively (on average). Most of the respondents also indicated that they felt stimulated to actively participate in the dialogue session (average score: 4.2). The organizers observed substantial interaction between the participants and experienced a sense of mutual respect, with participants trying to listen to each other and giving each other space to each have a say. Several respondents explicitly referred to the open and respectful attitudes of their fellow dialogue participants. In some of the dialogue groups, strongly conflicting ideas came to the table due to differences in individual perspectives. The table moderators tried to provide sufficient space to openly discuss these conflicts, although the tight schedule of the event did not always allow for a full exploration and disentanglement of conflicting perspectives.

4.2. Reflections on dialogue format

The organizers of the workshop aspired to work with a stimulating and playful dialogue format that would fuel significant interaction and reflexivity concerning the roles, responsibilities and practices of the different actors and the concept of responsiveness itself. The responses in the evaluation questionnaire showed that many people appreciated the “creative” dimension of the format and referred to the dialogue as “fun” or “stimulating”. On average, respondents rated their level of comfort to carry out the tasks of the dialogue exercises at 3.7 (on a five-point scale).

Generally, the respondents seemed more positive about the second half of the workshop (i.e. working towards recommendations) than the first half (explorative). Where some respondents indicated that they found the explorative exercises both insightful and helpful for grasping the concept of responsiveness, others felt that the aim of these exercises was less clear or of less practical relevance. Particularly the second exercise (i.e. the hypothetical nano-enabled application scenarios) triggered some critique, with several respondents indicating that they found it difficult to understand the background of this exercise. During the dialogue session itself, the organizers also noticed that some participants problematized the hypothetical applications that were used in this exercise, resulting in discussions that were focused on methodological issues concerning the exercise, instead of the contextualization of responsiveness.

Respondents described the afternoon exercises as relevant to them in practical terms and resulting in “interesting discussions”. Some mentioned that they would have liked to see even more time for these discussions, and others noted that the overall duration of the session was quite long (8 hours), which resulted in some tiredness during the final exercises. One point that was frequently referred to in the questionnaire was the value of hearing other

perspectives on experienced barriers to responsiveness and required actions to overcome these. This was also something that the organizers of the event observed during the dialogue session itself. In the "barriers exercise" (exercise 3), participants were clustered in their own stakeholder groups, and seemed to feel quite comfortable and consensual here. When again mixed with participants from other stakeholder groups in the next exercise (roles/responsibilities/action mapping), it was observed that the barriers experienced by others were of a completely different kind. During the session, some participants mentioned that this explicit move from "discussing with those with a similar background" to "those with other backgrounds" made them realize how easily we are drawn to like-minded people and emphasized the importance of discussions with people that have a different perspective.

A final point of reflection on the dialogue format relates to the organizers' choice to *not* give participants a clear definition of responsiveness up front. Instead, the different interpretations of responsiveness were collectively explored by participants in the first half of the dialogue, resulting in a broader and more diverse overall idea of what the concept is about. The advantage of this approach was that it provided space to become aware of the plurality of underlying perspectives and assumptions that play a role in many of the discussions in RRI contexts. Such awareness could help participants to understand where different points of view with respect to concrete recommendations for change stem from. However, the broad interpretation of responsiveness also allowed people to just focus on one particular aspect of the concept that interested them most, resulting in discussions in which participants did not always respond to each others' statements or talked at cross purposes. This was also noticed in the last exercises, where different ideas about roles, responsibilities and actions would not always be negotiated or contested in the group discussions. Evidently, this impacted the dialogue outcomes, in the sense that they now mainly focus on broad directions of change, instead of very concrete actions that were considered relevant by each of the participating actors.

Another impact of the lack of negotiation and contestation was that it complicated the identification of major differences or conflicting viewpoints *between stakeholder groups*. Although it was possible to observe that individual participants had different preferred themes that they would like to bring to the table, it was difficult to directly translate these observations to differences between the stakeholder categories. One observation that the dialogue organizers did make in this regard was the general tendency of nanoscientists and some industry representatives to focus more heavily on themes related to safety, collaboration and transparency, while participants in the "intermediaries" and "CSO" category seemed more inclined to introduce themes such as participation and societal engagement into the discussions. Looking back now, the day might have benefited from an exercise that forced more conflict and negotiation between participants, resulting in more specific directions for change, as well as a sharper insight into the differences in perspectives between stakeholder groups.

4.3. Reflections on participant group composition

The organizers of the event aimed to gather a well-balanced group of participants for this dialogue event with sufficient diversity in perspectives on the topic. Although a wide range of stakeholders attended the dialogue event, including several staff members of the EC, one particular stakeholder group remained underrepresented: civil society. In preparation of the dialogue event, the organizers contacted over 30 CSOs, including relevant organizations focusing on environmental issues, human rights, civil society involvement, patient representation, (labour) safety, and health. Some of these organizations indicated that nanotechnology was not one of their priority themes at the moment and others explained they had too little capacity in their organization to participate. Yet, some of them also sent more critical replies to the dialogue invitation. One of the organizations, for example, did not want to participate in any dialogue with industry until information on nanomaterials used in consumer products

is provided, and another one shared concerns about 1) how civil society views in participatory projects do not seem to be making any difference to the EC's approach to EU governance of nanomaterials, and 2) the lack of CSOs represented in the NANO2ALL project consortium itself and how this obstructs genuine engagement. These are important points of feedback that require further reflection and consideration in our endeavors to bring RRI into practice.

4.4. Concluding remarks

NANO2ALL looks back on a fruitful day of dialogue in which participants explored the concept of responsiveness and collaboratively identified directions for change in order to enhance responsiveness in the nanotechnology research and innovation system. This report will be shared with the EC and will serve as a basis for the responsible innovation roadmaps that will be created in work package 4 of the NANO2ALL project. In this work package, it will be a valuable endeavor to place the recommendations that have been put forward in this report in the context of other ongoing EC activities and the general debate on governance of nanotechnologies. Since some of the suggested directions for change in this report are still quite broad in nature, further prioritization of issues and actions is required, as well as action plans that distinguish between short, medium and long-term initiatives.

Malsch Techno Valuation


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