



NAIMO

“Nanoscale Integrated processing of self-organizing

Multifunctional Organic materials”

**Report on the Workshop: “Risk Perception and
Risk Communication in the Field of
Nanotechnologies”**

WP 5.5 Socio-economic and environmental impact

Written by:



Table of Contents

<i>Foreword</i>	3
<i>Introduction</i>	3
<i>Aim of the Workshop</i>	4
<i>Title: "Basics: Nano = New Questions for Analysis of Risk Perception and Risk Communication</i>	5
<i>Title: "Nanotechnology and consumer confidence"</i>	5
<i>Title: "From Golden Rice to Carbon Nanotubes: Challenges to Risk Communication in an Era of Technological Convergence"</i>	7
<i>Title: "Nano & Risk: Perspectives from a Reinsurance Company"</i>	8
<i>Title: "Communicational Hopes and Traps: A First Draft on Nano-Dialogues in Germany and Switzerland"</i>	9
<i>Title: "Building up the Dutch debate on nanotechnology from the bottom"</i>	9
<i>Title: "The recent Royal Society report into Nanotechnology and ongoing debates in the UK</i>	10
<i>Title: "Input: Public Perception of Nanotechnology"</i>	11

Foreword

The following report has been written by Innova S.p.A. in the framework of the activities related to the sustainability (socio-economic and environmental impact, WP 5.5) of the technologies developed in NAIMO.

The report is a short resume of the topics treated by the speakers during the meeting held in Karlsruhe on the 8th of December 2004, organized by Institute for Technology Assessment and Systems Analysis (ITAS), Forschungszentrum Karlsruhe in collaboration with EMPA St Gallen, Technology Assessment Lab (further information at this link: <http://www.itas.fzk.de/v/nano/home.htm>).

This short report does not want to be an in-depth treatise on the topics, rather just a general pictures of the ideas presented by the speakers. The power point presentations will be made available by the conference organizers in a couple of month.

The following sections, entitled “Aim” and “Background”, are extracted from the Conference presentation flyer. The abstract of the talks provided by the speakers is available only in few cases. The remaining section contains a short resume of the talks.

Additional pertinent documents available on the internet:

http://europa.eu.int/comm/health/ph_risk/documents/ev_20040301_en.pdf

<http://www.nanotec.org.uk/Market%20Research.pdf>

Additional links where documents can be downloaded are provided in the text

Introduction

Even though the most concepts summarized under the word Nanotechnology are research projects rather than technology, a debate has started about the risks which are linked with the development of Nanotechnology. At the moment, this debate may be limited to experts in science as well as selected media, politics and NGOs are involved only to a limited extent, but the outcome of this debate could be crucial for the further development of this emerging field of technologies. Up to now it is open if this debate will follow the path of the debate about other 'risk technologies' like GMO or nuclear power. There exists already a call for a moratorium for further development of Nanotechnology. Therefore, this debate could be an interesting example for studying what are the drivers, the actors, what are their motives and what is the overall dynamic of a debate about a new technology at its early beginning.

Special Challenges for risk assessment concerning Nanotechnology

There are some peculiarities of Nanotechnology which make the risk assessment challenging. The first aspect is the diversity of Nanotechnology. Because Nanotechnology is mainly defined in terms of size, a huge variety of different techniques, research topics, methods of creating or structuring materials, and manipulating surfaces are summarized under the term of Nanotechnology. Very often, the proponents have quite different things in mind when they are talking about Nanotechnology.

This diversity extends also in the time dimension. The stage of development of what is called Nanotechnology could be quite different. Some products and techniques are on the market - other concepts are considered as rather visionary or as plain fantasy.

A third aspect of Nanotechnology is the fact that NT is predominantly an enabling technology. This means that NT-based components or processes are usually only a part of a bigger technical system. They may give the final product the crucial functionality but their role is usually not easily identifiable or simply not recognised. So, there will be many very different products for very different purposes containing the same NT. For every context of use NT has to be assessed separately.

The fourth aspect of Nanotechnology is that for several reasons there is a enormous hype about this research field. Huge promises and expectations are presented on the one hand side, extremely dystopian visions exist on the other side.

The debate about challenges and risks is centered around more than one theme:

- Risks of visions or fictional scenarios, created or amplified by the popular culture and media
- Risks of new material properties occurring at the nanoscale - triggered by but not limited to the debate about health risks of ultrafines and nanoparticles
- Risks of new opportunities to improve or to expand human physical and mental capabilities (as a potential consequence of a success of NBIC-related R&D)
- On a different level but no less important: Risks of wrong or misguided communication or implementation strategies)

For that reason ITAS in cooperation with EMPA St. Gallen is organizing a one day workshop about risk perception, risk assessment and risk communication in the field of Nanotechnology. The workshop is mainly addressed to risk researchers, technology assessment experts, policy makers, sociologists, philosophers. The participation of researchers working in nanoscience or nanotechnologies is welcome.

Aim of the Workshop

The aim of the workshop is to structure the fields of risk research and risks assessment with respect to Nanotechnology, to provide a platform for the exchange of results about these topics, to identify new research questions and to give the opportunity for networking among interested researches and their respective organisations. General purpose of the workshop could be a "situation appreciation" and a discussion of research priorities, taking account the perspective of different disciplines and key actors.

Key Questions the Workshop is intended to address:

- Which kinds of risks are discussed with regard to nanotechnology? Which of those risks are NT specific? Are they different from other known risks?
- Is the debate about risks of nanotechnology comparable to other risk debates, like the debate about genetic engineering or nuclear power generation? Can experiences from these debates transferred to the debates about nanotechnology risks? What can key actors learn from these experiences?
- What are the dynamics of the debates about risks in the field of Nanotechnology? What are the drivers? Who are the actors, what are their intentions? How and by whom could such a debate be influenced?
- What is the right balance between the precautionary principle and fostering innovations?

Title: "Basics: Nano = New Questions for Analysis of Risk Perception and Risk Communication"

Speaker: Dr. Peter Wiedermann, Forschungszentrum Julich (D).

This talk was held by a psychologist. Several aspects concerning the concept of "risk perception" (RP) were addressed. Several questions arise when a new technology with such a high societal impact is being developed. The question on how people appraise the new technology will for sure arise.

Studies on risk perception with respect to NT are still lacking in the scientific literature.

Some studies were performed at a national level in Germany and the UK. The conclusions from the studies conducted in Germany were mainly that:

- NT is still an unknown subject to the public
- Those having a low or approximate knowledge level tend not to take a strong position against them
- There is no spontaneous risk association to this topic

The UK study, performed by the Royal Society (<http://www.nanotec.org.uk/finalReport.htm>) was done taking as sample people with no technical background in the field. Some of the conclusions drawn from this study are reported in the talk of Dr. Alison Mohr (see later in this report).

Main conclusions:

1. The urgent need of a categorization of Nanotechnology arises, to avoid that they are considered as a unique ensemble. This would enable an easier communication strategy of the benefit potentially brought by these technologies.
2. The funding situation of Social sciences is at the moment not enough to support research in the field. In Germany there is not a research centre dedicated to that.
3. There is a strong need to develop a systematic method for the governance of the benefit potentially brought by these technologies. During the discussion with the audience, it was suggested to possibly involve the consumers and other stakeholders in the process of shaping the direction on which the technological development will go: there is at the moment no idea on how to do that, and how this communication process has to be conducted in collaboration with the scientific community.

Title: "Nanotechnology and consumer confidence"

Speaker: Lynn Frewer, Wageningen University (NL)

Abstract

It is widely recognised that it is important to solicit the views of different actors in society regarding technology application and commercialisation. This is, in part, a response to broader recognition that societal values as well as technical risk assessment influence the acceptability of the products of new technologies. In addition, there has been a recent decline in consumer confidence associated with the process of technology-related risk assessment and management. Increased transparency in risk analysis is unlikely to increase consumer confidence unless the values bought to all three components (assessment, management and communication) are made explicit and communicated to society. There is empirical evidence that the relationship between consumer

trust and consumer acceptance of emerging technologies is complex, and not necessarily causal. In addition, other factors (risk - benefit perceptions, communication of uncertainty, consumer pull, the role of affect in information processing) will also influence consumer acceptance of nanotechnology. The implications for the future commercialisation of nanotechnologies will be discussed.

In this talk the problem of the acceptance of nanotechnology is addressed taking into account the consumer's point of view. Currently there are no studies on the subject, and this is mainly due to the fact that some of the most important applications of nanotechnology are still ahead in the future. The same situation occurred in the past for Genetically Modified food: taking as an example the debate developed in that field, it appears important that the consideration of consumer's perception with regard to NT is something that has to be taken into account since the very beginning.

A short overview of the possible short term application and of the application which are already in the market (such as sun screens and textiles) was done.

The need for a proper handling of risks, safety issues and ethical aspects of the application of NT is important to understand:

- what is driving consumer's perception concerning risks and benefits
- how to handle with consumers confidence
- how do people react to information about risks uncertainty.

As already experienced in the debate concerning Genetically Modified Organisms (GMO) the lack of a preliminary debate led to a decline of trust in the consumers.

The worst effect for consumers distrust is when they feel the risk is not controllable, that it comes from unnatural sources and can potentially lead to catastrophic effects.

The perception that the truth is hidden is another factor contributing to increase consumers distrust.

The answer to be given is not easy. Risk analysis methodologies, consisting in a structured process of risk assessment, risk management and stakeholders communication may be hindered by the distorted perception often observed in consumers behaviour, considering that:

- People no longer rely on experts
- They feel a need to improve transparency in the communication flow
- Risk assessment methodologies (based on the evaluation of probability) are not easy to communicate to the masses

Main conclusions:

- ⇒ A PROACTIVE communication strategy has to be undertaken avoiding the mistakes done in the past. For example, in cases such as BSE, Chernobyl and GMO the risk assessment community clearly stated that there were no risks. As a consequence the perception of the consumers easily falls in the conviction that they are lying.
- ⇒ The commercialisation strategy will for sure have important effects in the way the risks will be perceived by the consumers. The situation observed for food biotechnology teaches that the *a priori* assumption of public's trust, is very often wrong. If the message given by the information source is that the technology is giving positive effects, then the information source is very often distrusted.
- ⇒ During the debate following the talk, it was pointed out that there is a geographical difference in Europe for such as concern the perception of risks and the tendency to rely on the information. The aforementioned consideration that consumers do not believe in experts had been questioned: the situation has to be considered on a case by case basis.

Title: "From Golden Rice to Carbon Nanotubes: Challenges to Risk Communication in an Era of Technological Convergence"

Speaker: Michael D. Mehta, University of Saskatchewan (Canada)

Prof. Mehta is a sociologist, and studied over the last five years the problem of societal acceptance of NT. The talk was focused especially on the so-called convergent technologies, consisting in the confluence of the discoveries in the NT field with life sciences: bio-nanotechnology, medical applications of NT and merging with most recent finding in the field of cognitive sciences and information technology/computer science.

One of the most striking characteristics of NT is its *disruptive* character: this has to be meant as the potential radical change in the way the industrial production is conducted. It is also a *transformative* technology, in the sense that it has the potential to change the social relationships. It has also the characteristic of changing the way science is done. The public debate on NT is still poor, but constantly growing. It is expected not to be as passionate as the one in the biotechnology field. Nevertheless, several risks can be identified in the communication process and a proper strategy has to be designed.

A recent overview by *Forbes* listed the products already available on the market: they range from sky wax, high-tech textiles, sun-screens and other cosmetic products.

The introduction of some of these substances on the market might imply several regulatory issues which are not yet addressed at all.

Main conclusions:

- ⇒ Some recent manifestation of disapproval from NGO and in particular from the Canadian pressure group ETC (<http://www.etcgroup.org/documents/TheBigDown.pdf>) can be considered as a hint for future developments of the debate. Interviews released by Prince Charles are a worrying signal, outlining the difficulty to communicate the possible benefit of the new technologies, before hysteria spread among portions of the society. Prince Charles, having attacked GM foods in the past, has more recently turned his attention to nanotechnology. Concerned by claims by environmentalists that swarms of rogue "nanomachines" could one day reduce all in their path to "grey goo", the prince has asked the Royal Society to help him to weigh up the risks.
- ⇒ Connection to science fiction seems not to facilitate the debate also in a future perspective. Nevertheless, it has to be stressed out that the most famous NGO have still a very mild involvement into the debate.
- ⇒ The impact of NT on the society must be seen from a much broader perspective: NT can potentially lead to a further erosion of privacy. The economic impact has also to be taken into account, considering aspects relate to trade and intellectual properties. To conclude, the great expectation and potential of NT can be a double-edge sword.
- ⇒ During the debate following the talk, the problem of the definition of what is NT in the framework of the communication with civil society has been addressed and the need to define a risk-communication strategy tailored to the different applications of NT, on a case by case basis: this approach has been questioned, considering that if the public wants to define something as *nano*, then this is going to be *nano*, irrespective of what the scientific definition is or the technological application to which it is addressed.

Title: "Nano & Risk: Perspectives from a Reinsurance Company"

Speaker: Gerhard Schmid, Munich Re (D)

This interesting talk was held by a manager of the reinsurance company München Re. A few days before the another reinsurance company (Swiss Re) organised a similar conference in Zürich (the presentations given during this conference can be downloaded at the following address: <http://www.ruschlikon.net/INTERNET/rschwebp.nsf?Open>).

The interest of reinsurance companies for this sector is pretty clear considering that the market is potentially huge. It is a new field and the lessons learned from the GMO and nuclear energy debate will be hopefully valuable.

There is indeed a need for a professional management of the risks. Also in this case the speaker made a quick overview of the different potential applications and attempted a classification of the field of NT.

The health risks potentially envisaged from the diffusion of NT are:

- Risks related to the breathing of nanoparticles/nanomaterials
- Absorption through the skin
- Absorption through organs
- Accumulation in the organism

Regarding the products themselves, there might be a potential risk concerning product liability:

- Development errors
- Design errors
- Faulty manufacture
- Information errors (manuals)
- Product monitoring

These errors might be manifested in several stages of the products life, from its development in the laboratory, to the production process, storage and supply chain.

The environmental consequences of the diffusion of nanomaterials are also a subject of uncertainty. The behaviour of these materials in the human metabolism is still not clear. The question concerning more science-fiction-related topics (i.e. nanorobot) has also been addressed.

Main conclusions:

- ⇒ The solution proposed to properly manage the social relevance of these problems, is to open a **risk dialogue** process: this would mean to bring the people involved around a table.
- ⇒ The perspective of an insurance company deal of course mainly with **risks**: these are potential sources of economical losses. Applying risk assessment methodologies, the problem is expressed quantitatively through probabilities, which eventually allows setting up a *risk management* strategy: these are measures to prevent potential losses.
- ⇒ The whole process is of course applicable considering the technologies on a case-by-case basis. Considering the nature of NT, a so-called High Protection Risk approach must be undertaken. **Life Cycle observation (Lyfe Cycle Assessment)** of the different products has also to be taken into account. All the studies previously mentioned are the basis to build up a **dialogue** with all the stakeholders.

Title: "Communicational Hopes and Traps: A First Draft on Nano-Dialogues in Germany and Switzerland"

Speaker: Antje Grobe, Stiftung Risiko-Dialog (CH)

This talk presented the first small-scale attempts conducted in Switzerland and Germany to set up a platform for a public dialogue to study risk perception about nanotechnology.

The talk started from the consideration that in the case of NT, we are observing an inversion in the way the dialogue is being conducted. For example in the case of nuclear energy, the risk dialogue started after the accidents occurred. In the case of NT, we are in a phase in which the technology is not yet fully available on the market. We are very much in the early stages of the debate. The hope is that this is going to avoid what has been observed for GMO, where a negative perception developed when the products went beyond the research phase, and the products were introduced in the markets without taking into due account the opinion of the public.

A first small workshop was organized in Dresden, Germany. What was clear since the beginning was that there is not enough information about NT among non-technical audience: although uninformed, the audience did not give an *a priori* negative judgment on the technologies. Once informed on the topic and on the potential risks, there was not a substantial displacement from the former position. The speaker stressed out that this little experiment did not have a statistical relevance and it was just a very small attempt.

An interesting consideration on this initial experiments is that apparently stakeholders are more nervous than the public when it comes to take the risks into consideration. It was again observed that the main NGOs have very little or no involvement in the debate, which seems much more concentrated among the industrial organizations.

A mistake to be avoided is that before the debate starts the products are introduced in the market, leading to mistakes already done in the past.

The speaker cited a study which has very recently started in Switzerland, in which major industrial partners such as Ciba and Novartis are involved as well. This is aimed at comparing a range of products directed to the same application. The impact in terms of socio-economic and environmental (using Life Cycle Assessment methodologies) effects will be considered.

Title: "Building up the Dutch debate on nanotechnology from the bottom"

Speaker: Rinie van Est, Rathenau Institute (NL)

Abstract

In Spring 2003, the Dutch societal debate on nanotechnology was merely non-existent. Since then the debate in the Netherlands has taken off slowly, but steadily. The Rathenau Institute has played a central role in building up the debate from scratch, by organising a series of activities, like workshops, focus groups, newsletters, et cetera, which finally led to the first public meeting on nanotechnology in the Netherlands, titled "Small technology - Big consequences". This meeting was held on October 13, 2004, and organised in collaboration with the parliamentary Theme Commission on Technology Policy. The presentation will give an impression of the way in which the public debate on nanotechnology has developed during the last year, will highlight some of the outcomes of the debate so far, and will reflect on the type of activities that will be needed in the near future

This presentation was focused on the attempts undertaken in the Nederland to build up a process of social awareness concerning the possible developments and potential impact of the diffusion of nanotechnology. A great problem when dealing with these issues is HOW to involve the public in the debate. In other terms, how to organize the debate between science and society? It has to be taken into account that the awareness of public on this subject is still very low.

The necessity to focus on the application is important, nevertheless we have to keep the general picture as well.

Concerning the toxicological studies, the question is whether they are moving fast enough before the products are introduced on the market.

The dialogue on the subject must urgently start. A starting point could be **the building up of a network, involving natural and social scientist in the discussion, as well as policy makers and inform politicians.**

The outcome of several workshop held in the Nederland is that the awareness level among the large public is still very low, but the positive effect of the introduction of these technologies are welcome by the public. Public concern in most cases is directed to the potential risks for privacy, health and all the possibilities of enhancing the capacity of early diagnosis in nano-biomedical application.

To conclude, it was outlined that:

- ⇒ an early start of this dialogue would allow the government to prevent the debate to take the direction taken in the case of genetically modified organisms.
- ⇒ the debate must be implemented in the framework of the specific applications of nanotechnologies.
- ⇒ the social risks and opportunity have to be presented clearly and NGO and citizens might be involved since the beginning.
- ⇒ the studies on toxicological effects of nanoparticles have to be intensified.

Title: "The recent Royal Society report into Nanotechnology and ongoing debates in the UK

Speaker: Alison Mohr, Centre for the Study of Democracy, University of Westminster (UK)

The state of the art of the UK debate on nanotechnologies and risks is outlined in this talk. The story has started from some recent interviews released from Prince Charles (April 2003, June 2004, http://news.bbc.co.uk/2/hi/uk_news/3883749.stm) which have been cited already previously. This led to an explicit request to start an assessment process on the societal impact of NTs, which was commissioned to the Royal Society.

A summary of the RS report can be found at this address:

<http://www.spie.org/Membership/pdfs/NanoTechReport2004.pdf>

The full report can be downloaded at this address:

<http://www.nanotec.org.uk/finalReport.htm>

Also in this case, it has been outlined the low awareness of the public: only 29% of the people interviewed heard about the subject, 19% was able to give a general definition.

Two in-depths workshops with a small number of people have been organized in the UK. Again a parallel with the dialogues developed on the GMO and nuclear energy was done.

To summarize, the RS report was a starting point to stress out the need for an early involvement of the society, the proper funding for researches in the field, and the creation of an appropriate upstream dialogue.

The NANODIALOGUE project, recently launched in Europe, aims at addressing some of these issues, with the main objective of avoiding that most of the products are already introduced in the market before the dialogue has started.

Title: "Input: Public Perception of Nanotechnology"

Speaker: Ortwin Renn, University of Stuttgart (D)

Abstract

As any new technology, nanotechnology evokes enthusiasm and high expectations with respect to new progress in science and technology, new productive applications and economic potentials on one hand side, and concerns about risks and unforeseen side effects on the other hand (NSF 2000; Roco et al. 2000; cf. Roco & Tomellini, 2002). As many new technologies experienced a strong public opposition after their often euphoric introduction (nuclear technology, bioengineering, genetic modifications), it is important to understand in advance potential public reactions and potential mobilization effects by relevant social groups.

For improving our understanding one needs to investigate the evolving socio-cultural context in which research at the nanoscale is funded, the societal needs that nanotechnology may satisfy, and the popular images that experts, politicians, and representatives of the various publics associate with nanoscience and nanotechnologies. The past research on public attitudes and political mobilization has demonstrated that the effectiveness of public protest does not depend so much on the number of people concerned about a technology but rather on the composition of the groups that are willing to act publicly in favor or against the implementation of such technologies (Hampel et al. 2000).

Public perception of technological risks depends on two sets of variables: the first set includes the well-known psychological factors such as perceived threat, familiarity, personal control options, and positive risk-benefit ratio. The second set includes political and cultural factors such as perceived equity and justice, visions about future developments and effects on one's interests and values. While the first set of components can be predicted to some degree on the basis of the properties of the technology itself and the situation of its introduction, the second set is almost impossible to predict. The social, political and cultural embedding of a new technology is always contingent on situational, randomly assorted combination of circumstances that impedes any systematic approach for anticipation.

The psychological associations linked to nanotechnologies can be and are studied empirically (cf. Bainbridge 2003). The main problem here is that for more than 90 percent of the respondents in European as well as U.S. surveys the term nanotechnology has no meaning and evokes educated guesses at best (Rocco and Bainbridge 2001). Even if the term is explained to the interview partners, the response is a direct reaction to the verbal stimulus and thus more an artefact of the questionnaire than a valid representation of a person's attitude. A more promising method would be to conduct focus groups in which proponents and opponents of nanotechnology would be given the opportunity to develop their arguments in front of representatives of the general public or selected groups and then ask the respondents to share their impressions and evaluations.

Looking at the empirical results so far, it is interesting to note that the concern about the science-fiction notion of self-reproducing nano-robots or other more exotic applications of nanotechnology that could harm humans directly has been rarely found in the few surveys conducted until today (the theses of Joy, 2000, and others have not found much resonance in the public). Rather, critical remarks center around the concern that nanotechnology would be misused by some people to harm other people, exacerbating existing social

inequalities and conflicts. In contrast, most respondents associated quite a number of direct but non-specific benefits and found a number of ways to express confidence that nanotechnology would help human beings achieve legitimate goals (Bainbridge 2003).

The social and cultural aspects of perception can be investigated by a combination of theoretical concepts (for example reflexive modernization approach) and empirical illustrations (we are far from empirical validation). On the basis of sociological theory one can deduct potential interest violations, mobilization potentials and societal opportunities or constraints for political action. For this purpose, it is important to analyze the motives, interests and resources of social player and simulate their influence on the policy process. Such a study will not be able to predict the exact development of the controversy over time, but may help decision makers to prepare themselves for what they could expect in the future. It is more a contingency analysis than a prediction.

An alternative route to understanding the more complex social and cultural responses is to organize public participation forums that simulate a microcosm of what one could expect in society as a whole (Renn 1999). Such forums are worthless if the outcome has no political impact. Only if these forums are constructed to enlighten policy makers or even co-determine public policies, can they fulfill their mandate to provide a public platform that simulates and precedes a similar debate in the wider society. Such forums will and should not replace the wider debate in society but it may pre-structure this debate and provide policy makers with suggestions and policy recommendations that they can successfully use in the wider debate that follows.

The speech given by Prof. Renn (an environmental sociologist) as displayed in the long abstract aimed at giving a final overview of the whole debate.

First of all the application of NT were roughly classified with respect to the time frame of their application: we can distinguish long term (textile, consumers products, diagnostic and therapeutic, renewable energy and new generation IT) and short term applications (nanorobot, enhanced weapons, enhanced human).

The potential side effects of NT with short term application are roughly identified as:

- Physical damages in cells
- Novel chemical properties with side effects for living organisms
- Uncertainty about the environmental impact

We currently have the instruments to manage the aforementioned problems.

For such as concern the long term application, the boundary with science fiction is still quite blurry. Convergence between disciplines such as Artificial Intelligence, nanotechnology and biotechnology pose long term threats which are quite speculative and need different tool to be managed.

Some of the technologies may have benefit, but some other may not. The promises and expectation are indeed very high and if these expectations will not be met, this would be an additional source of problem. Some technical, ecological and environmental issues are still not defined. NT is a very complex field interconnecting several disciplines (materials science, chemistry, physics and life sciences), and sometimes the relationship between the fields is not clear.

Some guidelines directed to different stakeholder have been outlined. Industry should learn the lessons from GMO: trivial product with no great benefit to the society are not welcome. They should focus on products with high benefit. A risk/benefit assessment methodology should be applied on a case by case basis, and it should be employed in the communication of the risks. Scientists should be impartial and independent. They should develop interdisciplinary concepts and promote social and psychological researches. It should be also emphasized the need to improve the communication skills. The civil society should clearly state what are the concerns and open a dialogue among stakeholders. Make a clear difference compared to other debates developed in the past (BSE, nuclear power, GMO). Politicians should provide platforms for discussions, support technical, economic and social science studies.

During the open speech it was stressed out the difficulty one might encounter in communicating to the public the difference and the boundary between long and short term applications.

A toxicologist present in the audience outlined that from this point of view it is going to be a very complicate mater, since every substance has different effects, as observed in several preliminary studies already undertaken. Someone commented that the toxicological aspects is just one portion of the problem and that the debate should be introduced in the political agenda right now.